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HYDROGRAPHIC OFFICE

# THE HAWAIIAN ISLANDS

AND THE

ISLANDS, ROCKS, AND SHOALS

TO THE

WESTWARD





Nov. 11 1899



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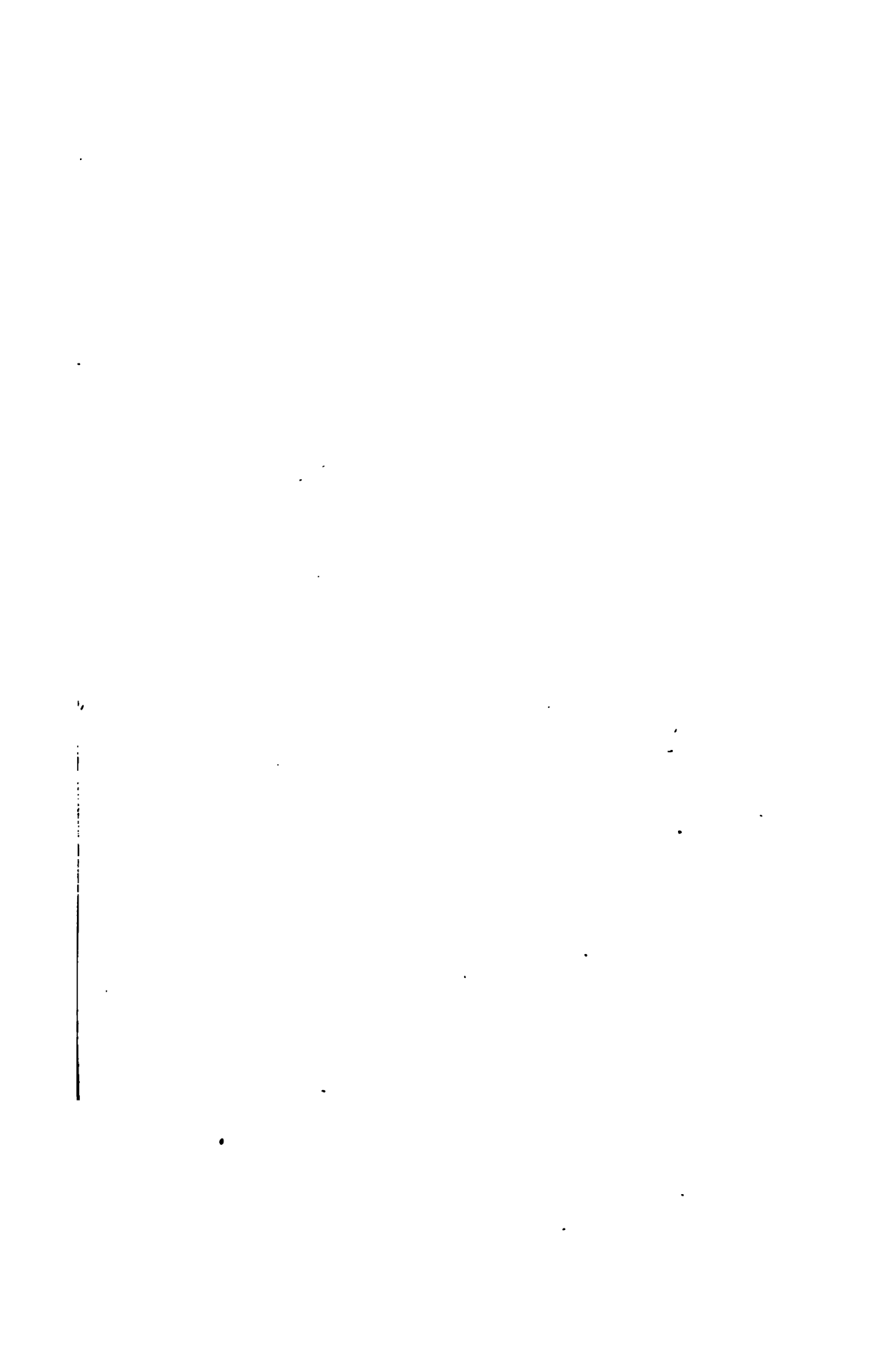
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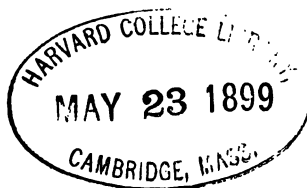
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WASHINGTON:  
GOVERNMENT PRINTING OFFICE.  
1899.

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From the  
U. S. Government.

## PREFACE.

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Sailing directions for the islands in the Pacific Ocean are in course of preparation in the Hydrographic Office. They are being prepared from reports of United States naval and consular officers, the sailing directions of the British Admiralty covering this region, and such late information as has become available.

For convenience it has been thought well to publish in advance, under separate cover, that part of the directions covering the Hawaiian Islands. This has been compiled by Mr. R. C. Ray, U. S. N.

J. E. CRAIG,  
*Commander, U. S. Navy, Hydrographer.*

UNITED STATES HYDROGRAPHIC OFFICE,  
WASHINGTON, D. C., *March 31, 1899.*

## NOTE.

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The bearings, courses, and trend of the land are true; but for convenience the corresponding magnetic bearings, to the nearest degree, follow in parentheses. (Variation in 1900.) The directions of the winds are given for the points from which they blow; the directions of the currents for the points toward which they set. Distances are expressed in nautical miles. Soundings, unless otherwise stated, are reduced to mean low water.

U. S. HYDROGRAPHIC OFFICE CHARTS TO BE USED WITH THESE  
DIRECTIONS.

No.	Title.
1216	Hawaiian Islands, with the Islands and Reefs to the westward.
1368	Hawaiian Islands.
1788	Port of Honoipu, and Mahukona Harbor.
1096	Hilo Bay, East coast.
1257	Harbors on the West coast of Hawaii: Kawaihae, Kailua Bay, Keanuhou Bay, Kealahou Bay.
1244	Harbors in Maui: Kapueokahi (Hana) Bay, East coast; Napili Bay, Northwest coast; Makena Bay, Southwest coast; Kahului Harbor, North coast.
132	Lahaina Road, West coast of Maui Island, and Maro Reef.
867	Southern part of Oahu, including the whole of the South coast, and the East coast to Kaneohé Passage; with Pearl River and Lochs, Honolulu Harbor, Hanauma Bay, Kaneohé Bay, and their approaches.
1381	Honolulu Harbor.
1141	Pearl (Ewa) River and Lochs.
1252	Harbors of Oahu: Northwest coast, Waimea Bay and Waialua Bay Southwest coast, Barbers Point; and Northeast coast, Laie Bay.
1264	Port Waianae and adjacent coast.
1251	Harbors of Kauai: North coast, Hanalei Bay; South coast, Waimea Bay; East coast, Hanamaulu Bay; and Southeast coast, Nawiliwili Harbor.
2	Islands in the North Pacific to the westward of Hawaiian Islands: Bird Island, Necker Island, French Frigate Atoll, Gardiner Island, Maro Reef, and Laysan Island.
4	Islands and Reefs WNW. of Hawaiian Islands: Pearl and Hermes Reef, Midway Islands, and Ocean (Curé) Island.
5	Seward Road and Welles Harbor, Midway Islands.
1571	Smith, Johnston, or Cornwallis Island.



## HAWAIIAN ISLANDS.—ISLANDS, ROCKS, AND SHOALS WESTWARD OF THE HAWAIIAN ISLANDS.

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(H. O. Chart No. 1368.)

The Hawaiian Islands, situated between the parallels of  $18^{\circ} 56'$  and  $23^{\circ} 7' N.$  and the meridians of  $154^{\circ} 49'$  and  $161^{\circ} 59' W.$ , lying in a NW. by W. and SE. by E. direction, consist of eight islands and some small rocky islets; the entire group having an area of about 6,000 square miles.

These islands were first made generally known to Europeans by the third voyage of Cook, in 1778, but it appears probable that they were previously known to the Spaniards, as in some charts, taken by Anson from a Manila galleon, there is a group of islands called Los Magos, placed between latitude  $18^{\circ}$  and  $22^{\circ} N.$  and longitude  $135^{\circ}$  and  $139^{\circ} W.$ , the different members of which are named La Mesa, La Desgraciada, Los Monges, etc.

The Spanish word Mesa, signifying table, probably refers to Hawaii, the summit of which, unlike those of most volcanic islands, appears flat; also the position as regards latitude would seem to point to the conclusion that the group is identical with what is now known as the Hawaiian Islands.

On the 18th January, 1778, Cook sighted Kauai Island, and on the 20th January he anchored in Waimea Bay, on the SW. side of the island; he named the group the Sandwich Islands in honor of the Earl of Sandwich, the first lord of the admiralty.

After visiting the coast of North America, Cook again returned to the Sandwich Islands, anchoring at Kealakekua Bay, on the west side of Hawaii, on 17th January, 1779.

The natives were found to be friendly and hospitable on this occasion, and Cook took his departure on 4th February, but during a gale on the 8th, the *Resolution* being disabled, the vessels returned to Kealakekua Bay on the 11th.

On this occasion, from some uncertain cause, a chief was killed, and several petty thefts being resented, a misunderstanding speedily arose which led to a conflict with the natives, in which the distinguished navigator was killed on 14th February, 1779.

The vessels left Kealakekua Bay on the 22d, and an examination was made of the group, leaving finally on 15th of March, 1779.

The next visitors were Captains Portlock and Dixon in the *King George* and *Queen Charlotte*; they anchored in Kealekekua Bay on



26th May, 1786, and left the group in June, and on two subsequent visits at the end of the year, and also in 1787, they called at most of the islands, and were well received by the natives.

It appears that La Perouse was at the islands at the same time as Portlock and Dixon; he anchored at Maui Island and left on 1st June, 1786.

In 1787 Captain Meares visited the group, remaining a month, and reported very favorably on the disposition of the islanders; and in 1788 and 1789 Meares and Douglas visited the islands, the latter remaining amongst them about four months.

Between the years 1790 and 1795 Vancouver called in on three occasions; in 1793 he introduced cattle and sheep from California, landing them at Hawaii; he also endeavored to bring to a close the fatal wars then continually raging between the natives of Hawaii and those of the other islands.

In 1794 Kamehameha, the chief of Hawaii, accomplished the subjugation of all the other islands, and when he died, in 1819, at the age of 66, he was king of the whole group. He was succeeded by his son Liho Liho, during whose reign the first missionaries arrived in the group, sent by a society in the United States.

A treaty providing for the annexation of the Republic of Hawaii to the United States was concluded and signed at Washington, June 16, 1898, and on that date sent to the Senate for its constitutional action; but before this was formally taken a "Joint Resolution to provide for annexing the Hawaiian Islands to the United States" was passed by Congress, and on July 7, 1898, was approved by the President. It was in virtue of this provision of law that the Republic of Hawaii became a part of the sovereignty of the United States. On August 12, 1898, the Hawaiian flag was hauled down from the Government buildings, and the United States flag raised in its stead.

**Physical Character.**—The whole of the islands comprising the Hawaiian Archipelago are volcanic, and mainly due to the effects of successive eruptions from craters which have been active through long periods of time; whether at any period any of these islands could have been classed among the atolls, so common all over the Pacific, is unknown, as they have not been very critically examined; well defined coral has, however, been found at the height of 500 feet in Molokai, and a bed of coral also exists at an elevation of 4,000 feet in Kauai; coral, interstratified with lava beds, is also reported to have been found in some of the other islands.

**The Earthquakes** experienced in this group are rarely severe or destructive; the heaviest occur in the district south of Mauna Kea, in Hawaii. The sea wave, however, the usual attendant of

earthquakes originating near the seacoast, is often very destructive, sweeping away villages and causing great loss of life and property. Of the inactive craters, Puowina or Punch Bowl Hill, and Leahi or Diamond Hill, in Oahu, are well known from being near Honolulu, the capital; but the most remarkable and the largest known crater in the world is that of Mauna Haleakala, in the east part of Maui, 10,030 feet above the sea. The rim is over 12 miles in circumference and 2 miles wide in its broadest part; it is destitute of trees to the height of 2,000 feet, then a belt of forest to the height of 6,000 feet succeeds, from whence to the summit is bare.

In May, 1877, a seismic wave caused great damage among the islands; it appears to have occurred simultaneously all over the group, namely, at about 4.45 a. m.

The range at Hilo was estimated at 36 feet, and at Kealakekua, 30 feet; while at Honolulu it was only 5 feet.

**The Natives** of these islands are strong, active, well made, and rather above the average height of Europeans, the complexion of the upper classes being comparatively fair; the men make excellent sailors and are largely employed in vessels trading in the Pacific.

According to the census of 1890, the population of the whole group numbered 89,990.

**Supplies**, both for exportation and ships' use, may be obtained in great variety; all the usual tropical fruits and vegetables are indigenous, while a vast number of animals and plants introduced since the days of Cook have thriven well and are now abundant.

Cattle and sheep are plentiful in all the large islands, and poultry may be obtained in any quantity. Sugar, coffee, rice, tapioca, wheat, corn, beans, peas, yams, taro, potatoes, oranges, limes, grapes, pineapples, pumpkins, breadfruit, plantains, and many other fruits and vegetables flourish, and are in constant demand for vessels calling at the various ports.

**Coal** can be obtained at Honolulu.

**Time.**—Standard mean time of the meridian  $157^{\circ} 30'$  W., or 10 h. 30 m. slow of Greenwich mean time, has been adopted for the Hawaiian Islands.

**The Climate** is considered healthy for Europeans and on the whole favorable to vegetation, whilst the soil, volcanic in its origin, is generally fertile.

**Winds and Weather.**—The NE. trade wind, generally blowing strong, prevails for eight or nine months in the year, beginning about the early part of March, and until May blowing well from the northward. From May to October it is more easterly in direction.

The trade causes a very heavy sea in the channels, and during this period, for many miles to leeward of the larger islands, frequent calms and light, baffling winds impede navigation between the various ports.

During October light trades and calms occur, and sometimes a swell from WSW., which makes the anchorages on the lee sides of the islands disagreeable, though not unsafe.

During November and December the trade is strong, but irregular, and sometimes interrupted by light southerly winds.

In January and February, when the rainy season commences, strong southerly and southwesterly gales, called by the natives *Konas*, often occur, which last from a few hours to two or three days, followed by rain, and render all the lee anchorages unsafe. The rainy season usually ends in April or May.

On the west coast of Hawaii, land and sea breezes are very regular.

**Currents.**—The general direction of the currents in the vicinity of the islands appears to be to the westward, with a rate of one to  $1\frac{1}{2}$  knots an hour; but they are subject to much variation, both in force and direction, in different seasons, without appearing to be influenced by the winds or to follow any general law.

**Pilots** are always ready at every port to board vessels on the usual signal being made. Most of the ports are accessible without their assistance, others are not; strangers, therefore, are recommended to employ them.

#### HAWAII ISLAND.

**Hawaii**, the southeastern, and formerly spelled Owhyhee, is by far the largest island of the group; the west coast trends nearly north and south for about 80 miles from Upolu Point to Ka Lae; hence the SE. coast trends for 60 miles to Cape Kumukahi, and the NE. for 75 miles from Cape Kumukahi to Upolu Point.

To one unacquainted with the great height of the mountains of Hawaii, this island might appear of comparatively small elevation, for its surface rises gradually from the sea, uniform and unbroken; no abrupt spurs or angular peaks are to be seen.

By reason of the great height of this island, the climate on the weather and lee sides is very different, for the NE. trade, striking the high land, causes abundance of rain to fall on the eastern side, while on the western coast rain seldom falls; hence the rich hues on the eastern slopes of Hawaii, covered with verdure and vegetation, contrast strongly with the bare and arid look of the coast on the greater part of the western side.

Consequent on the numerous eruptions that have taken place on this island, and the lava streams that have flowed in all directions

from the volcanoes, a great part of the interior of the island is a barren desert, with but few inhabitants, and many of the once beautiful valleys have been converted into black-looking, desolate tracks of cinders, mud, and lava.

**Local Magnetic Attraction.**—Reports have been received from H. M. S. *Sappho* that in the vicinity of Hawaii the compass of that ship was affected when near the island.

**Mauna Kea**, 13,805 feet in height, is the highest point of Hawaii, and may be described as a vast mound, surrounded with nine cones, which may be considered as craters, from which no activity has been observed for a great number of years. The sides of this mountain are clothed with vegetation to within 1,000 feet of the summit; in the winter months frosts prevail, and it is capped with snow.

**Mauna Loa** is nearly as high as Mauna Kea, being 13,675 feet in height, but of very different formation. Its summit is an active crater, which appears as an enormous flattened dome, sloping gradually down on all sides, and presenting a perfectly smooth appearance from seaward. All vegetation ceases at about 4,000 feet from the summit, and from thence to the edge of the crater extend fields of lava.

This volcano was ascended and numerous observations made by the U. S. Exploring Expedition in 1841. The crater is a very extensive one, and is still active; terrible eruptions have taken place at intervals of a few years, and great destruction is caused, both by the streams of lava, the earthquake, and attendant sea wave.

**Kilauea** is also an active volcano, 4,000 feet high, lying 18 miles to the eastward, and on the slope of Mauna Loa. The crater is  $3\frac{1}{2}$  miles long,  $2\frac{1}{2}$  miles wide, and about 700 feet deep.

**Hualalai**, a peak 8,273 feet in height, is near the west coast of the island. On the summit is a large crater, which has not been active for some time; the last great eruption from it took place about the year 1810.

This mountain rises abruptly on its western side, but viewed from seaward it presents a magnificent slope.

**Ka Lae**, the south point of the island, in latitude  $18^{\circ} 56' 30''$  N., longitude  $155^{\circ} 41' 00''$  W., is very low, and rises with a gentle slope to the hills behind.

**Kaalualu.**—From Ka Lae the coast trends NE. by E. 6 miles to Kaalualu, where there is a small bay and fair anchorage, formed by an old lava flow jutting out to the southward; the lava also runs out some distance into the bay, but the shallow water is easily discerned by its light green color.

Good shelter may be obtained during the prevailing NE. trade, but with southerly winds the anchorage is much exposed. In

August, 1882, H. M. S. *Sappho* remained at anchor here for  $2\frac{1}{2}$  days, in 10 fathoms, bottom white sand and lava patches, with the extreme of the point bearing N.  $89^{\circ}$  E. (N.  $79^{\circ}$  E. mag.). With 40 fathoms of cable, there was plenty of room to swing clear of the edge of the lava flow.

In the NE. corner of the bay there is a good pier for landing, but a boat has to avoid several very shallow patches of lava on which there is always a heavy swell.

There are only a few huts here, and no supplies of any sort are to be obtained.

**Honuapo** is a village about 7 miles NNE. of Kaalualu, where there is a large sugar mill near the beach, and a wharf. When practicable, the coasting steamers call here, but the landing is very bad and often impossible.

**Punaluu** is a very exposed roadstead in the Kau District, about 4 miles NE. of Honuapo. There are two buoys moored in 13 and 17 fathoms which the small coasting steamers make use of, and NE. of them anchorage may be obtained in 15 fathoms, but it is not recommended unless the weather be very fine.

There is a large village inland, about 6 miles NW. of Punaluu.

**Lights.**—Two small lighthouses are placed in line with the buoys, and to the southward of them is a wharf, slightly protected by a projecting point of rock.

**Coast.**—From Punaluu the coast trends NE. by E. 45 miles to Cape Kumukahi, the east point of the island, and in all this distance there are no bays or good anchorages, as it is exposed to the wind and swell.

When beating up to windward against the trade wind, along this coast, keep close inshore, not going farther off than 20 to 25 miles, thereby avoiding a great deal of the current, which runs at times as much as  $1\frac{1}{2}$  knots per hour to the southwestward, outside this distance; the shifts of wind close inshore are generally favorable. Near Cape Kumukahi there is an eddy current at times, enabling a vessel to round the cape with ease.

**Cape Kumukahi** is low and rocky, with some tree-covered hillocks a short distance to the westward.

From Cape Kumukahi the coast trends, with a slight curve to the NW., 16 miles to Leleiwi Point. This coast is precipitous, and the sea continually beats on it with violence.

There are several villages near the shore, and the land is well cultivated.

**Leleiwi Point** is very low and wooded, with some scattered cocoanut trees growing on it.

**Keokea Point**, the eastern extremity of Hilo Bay, lies  $2\frac{1}{2}$  miles W. by N. of Leleiwi Point.

**Hilo Bay**, also called Byron Bay, on the east side of Hawaii, is the only anchorage on this coast. It is about 7 miles wide between Keokea Point and Alia Point, and 3 miles deep.

This bay is fully exposed to the NE. trade wind, and would afford no anchorage, were it not for the extensive shoal, named Blonde Reef, which extends from the eastern part of the bay for  $1\frac{1}{2}$  miles in a westerly direction, leaving a channel  $\frac{3}{4}$  mile wide between its western extreme and the shore.

There are depths of  $1\frac{1}{2}$  to 5 fathoms on Blonde Reef, on which the sea breaks heavily at low water when much swell is setting in.

The scene which the island presents as viewed from the anchorage in Hilo Bay is both novel and splendid; the shores are studded with extensive groves of cocoanut and breadfruit trees, interspersed with plantations of sugar cane; through these, numerous streams are seen hurrying to the ocean; to this succeeds a belt of some miles in width, free from woods, but clothed in verdure; beyond is a wider belt of forest, whose trees, as they rise higher and higher from the sea, change their character from the vegetation of the tropics to that of polar regions; and above all tower the snow-capped summits of the mountains.

From Keokea Point the coast trends with a curve,  $1\frac{1}{4}$  miles WSW., to Mokuola or Cocoanut Island, which lies off a point from which it is separated by a narrow channel only a few yards wide, and a ridge of rocks extends 300 yards north from it.

Several small buildings are located on Mokuola Island, which is used as a quarantine station.

A rock with 7 feet of water over it, and 5 fathoms around, lies about 200 yards S.  $83^{\circ}$  W. (S.  $73^{\circ}$  W. mag.) from the house on Cocoanut Island.

From Cocoanut Island the coast turns SW. for 800 yards to Waiakea Creek and Village, where landing may be effected in all weathers. The water in this creek is only fit for washing purposes. There are two piers to the northward of the entrance of the creek, alongside the northernmost of which vessels drawing 15 feet of water can lie.

The shore then turns to the westward, along a sandy beach, for nearly one mile, to the bottom of the bay, where the town Hilo is situated.

Halai beacon, on Green Hill back of the town, is not conspicuous, as a large tree obscures the base.

A large mill (Hilo Sugar Company) has been erected on Aleales Point, and Turret Rock has been utilized as the foundation for the landing and sheds for the storage of sugar. The extensive camp is just back of the mill.

**Hilo** is the principal town in Hawaii, and ranks next to Honolulu in importance and population. The town may be easily recognized from seaward by the tall, white, square towers of the Roman Catholic church, and the pointed white spire of the Protestant church; there are also several other large buildings, both public and private.

There are several sugar plantations in the vicinity of Hilo, on which the town is mainly dependent for prosperity. Besides sugar and molasses, Hilo exports hides, tallow, goatskins, arrowroot, rice, and a small amount of coffee.

The rainfall here is very great, and accounts for the luxuriant verdure of the district; as much as 150 inches has been known to fall in one year.

Steamers communicate with Hilo from Honolulu once a week, and schooners ply constantly between the two ports.

Close westward of the town is Waterfall Creek, the mouth of Wailuku River, and about 2 miles from the entrance are Rainbow Waterfalls, 105 feet in height. The eastern side of the entrance is Cocoanut Point. There is a good watering place up this creek, which is generally easy of access except when the wind is blowing hard from seaward; on such occasions the surf is high, and the rocky bar at the entrance then becomes dangerous for boats to pass. The water is excellent and abundant.

From Cocoanut Point the coast trends to the northward for  $7\frac{1}{2}$  miles, in almost a straight line, to Alia Point. This coast is a steep bluff, about 200 feet high, broken by deep ravines, called "gulches," in which the villages are situated; these gulches are from 800 to 1,000 feet deep, and, apparently, worn by water courses. There is no landing for boats, as all along this coast the surf beats on the rocks with great violence.

**Supplies** of nearly all descriptions can be obtained. Beef, 10 cents a pound; bread, about 9 cents, and vegetables at 6 cents.

**Landing**.—The only landing place is at Waiakea. There is no longer landing at the small pier in front of the town of Hilo.

**Buoys**.—A red nun buoy, surmounted by a disk painted black, is moored off the NW. end of Blonde Reef.

Two small buoys have been placed, by the Wilder Steamship Company, in 3 fathoms of water NE. of Cocoanut Point. They are used for stern lines, and for warping lighters. Other small buoys SW. of Cocoanut Point are used for stern lines of sailing packets.

A small buoy off Turret Rock is used for lightering sugar.

**Lights**.—A red light is exhibited from the pier.

On Paukaa Point, from a lighthouse, resembling a red water tank on an open framework tower, painted white, is shown a fixed *white light*, 170 feet above the sea and visible 10 miles.

**Pilot.**—Pilotage not necessary; merchant vessels without coasting license are required to pay half pilotage if pilot is not taken. Rates, \$1.50 per foot draft. Only one government pilot.

**Anchorage.**—Hilo Bay is a safe anchorage, and, next to Honolulu, may be considered the best in the Hawaiian Islands. In 1841, during the three months December, January, and February, when the ships of the U. S. Exploring Expedition were lying in the bay, they did not have the wind strong enough to tauten their cables; and the residents say that the wind never reaches the force of a gale here.

With a strong trade wind there is a slight sea, unpleasant enough for boats, but not sufficient to endanger the safety of a vessel. At times, however, a considerable swell sets in, which causes a vessel to roll disagreeably. The northerly wind, which is felt most, seldom blows strongly.

A well-sheltered anchorage can be picked up anywhere under the lee of Blonde Reef, in from 5 to 7 fathoms, as the reef affords good protection. A vessel drawing 15 feet or less may anchor so as to be quite under the lee of Cocoanut Island and Keokea Point.

**Directions.**—When making for the anchorage, as a general rule, it is best to close the land a little to the northward of the reef, about east of Paukaa lighthouse, and then run down along shore rather within a distance of  $\frac{1}{2}$  mile, until Turret Rock (1,400 yards N. 10° W. (N. 20° W. mag.) of Cocoanut Point, and 15 feet high) bears N. 80° W. (West mag.) when the course may be altered for the anchorage under the lee of the reef.

The tower of native church seen between towers of Catholic church S. 21° W. (S. 11° W. mag.) leads into the bay, west of Blonde Reef.

On approaching the bay from the eastward, Honolu or Cocoanut Cove, about 400 yards south of the lighthouse, is a good spot to steer for, as it leads close to the entrance of the channel. The cove appears like a dark mark in the land, and there is nothing in the vicinity which resembles it.

On putting to sea, it is advisable to beat well to windward in a northeasterly direction after clearing the reef, not attempting to weather Alia Point until it can be done with certainty at a distance of 5 or 6 miles, as the trade wind may fail close in to the shore, which is very steep-to, and a heavy swell and current set constantly against the precipitous cliffs.

**Tides.**—It is high water at full and change at 1 p. m.; rise of tide about 3 feet.

**The Coast NW.** of Alia Point is steep and rocky, without shelter or anchorage, and innumerable cascades and streams run down the mountain sides, over the cliffs, into the sea. Here and



there are a few small bays, or breaks in the cliffs, where the natives are able to land in their canoes on the sandy beaches.

From Alia Point the coast of the island trends NW. by W. 51 miles to Upolu Point. There is a small open bay under Mount Kohala, but it is too much exposed to be used as an anchorage. West of this bay, off the western extremity of some black rugged cliffs, are several rocky islets a short distance from the shore; thence to Upolu Point the sea breaks heavily near the shore, and a heavy confused sea sets up, which may possibly arise from a sudden decrease in the depth, as Vancouver obtained soundings of 7 fathoms at 2 miles from the shore.

**Lights.**—A fixed white light is shown on Keawemoe, near Alia Point. It is 65 feet above the sea, and is visible 10 miles. The lighthouse is a wooden framework tower, surmounted by an inclosed lantern painted white, and bears N. 7° E. (N. 3° W. mag.) from the lighthouse on Paukaa Point.

A small harbor light is shown near Laupahoehoe Point.

A fixed white light is shown on Kauhola Point, west of Keo Kea Harbor. It is 60 feet above the sea and visible 10 miles. The lighthouse is similar to Keawemoe.

**Upolu Point** is the northern extremity of Hawaii. The land behind is an extensive plain, in a good state of cultivation, which rises gradually to the foot of the mountains.

From Upolu Point the coast curves round quickly to the southward, and trends for 14 miles S. by E. in almost a straight line to Kawaihae.

**Mahukona** is a small village, with anchorage off it, about 6 miles south of Upolu Point. The place is becoming of importance. There is a convenient landing place, and a railway 15 miles in length has been constructed to bring the sugar from the Kohala District, round the north end of the island. The cargo boats lay alongside the pier, and are laden and cleared very quickly by means of a steam "crab," which works a truck up and down the incline.

There is no water in the place. All the fresh water has to be brought from Kohala by train.

Anchorage may be obtained in 10 fathoms, a little to the southward of the outer buoy; but it is not very good, on account of the nature of the bottom, which is coral with sandy patches, and the strong gusts off shore, which blow continually from off the Kohala Hills in the day time, but generally cease at sunset during the NE. trade; and vessels are liable to drag off the bank, which is steep-to. This anchorage, therefore, is but indifferent, and, with winds to the westward of north or south, would be untenable.

Freight is disembarked and shipped at night during the greater *part of the year.*

The soil along this shore is barren for 3 or 4 miles inland, owing to the want of rain. The face of the country is regular, ascending gradually from the coast to the summit of the high land.

**Buoys.**—The buoys are can buoys, the two inner ones being black and the outer ones red. They are used for stern lines of vessels loading or discharging cargo.

**Beacon.**—On the north side of the harbor, on the first point southward of Makaohule Point, there is a whitewashed stone beacon about 20 feet high. It bears N. 4° W. (N. 14° W. mag.) from the lighthouse.

**Light.**—A fixed white light is exhibited from a white lighthouse  $\frac{1}{2}$  mile southward of Mahukona Anchorage. It is visible 9 miles.

**The Coast** from Mahukona to Kawaihae Bay appears clear of offlying dangers, and no bottom was obtained with 20 fathoms of line at  $1\frac{1}{2}$  miles from the shore.

**Kawaihae Bay** is an extensive open bay, about 8 miles wide, and 4 miles deep, fully exposed to the westward.

Situated in a grove of cocoanut trees, just behind a sandy point, near the center of the bay, is Kawaihae Village, consisting of a general store, two or three houses, and several huts along the shore. In front of the village there is a pier for boats.

The soil of this district that lies along the coast, though rich, is badly watered, and 7 or 8 miles in the interior from Kawaihae Bay it becomes exceedingly rocky and barren.

The climate is, upon the whole, unpleasant, especially at Waimea, about 9 miles eastward of Kawaihae, in consequence of the trade wind, which is exceedingly strong, bringing with it a mist towards sunset. This wind rushes furiously down between the mountains which bound the valley of Waimea, and becomes very dangerous to shipping in the bay. It is called by the natives *mumuku*, and is foretold by them from an illuminated streak that is seen far inland, which is believed to be caused by the reflection of the twilight on the mist that always accompanies the *mumuku*.

The principal exports of the district are hides, tallow, and beef.

On approaching the anchorage a good landmark is a conspicuous mound, situated a short distance south of the village, which was used formerly as a place for offering sacrifices. Another conspicuous mark is a white tomb, in the form of a pyramid, lying  $\frac{1}{4}$  mile S. 68° E. (S. 78° E. mag.) of the lighthouse.

**Reef.**—Toward the bottom of the bay there is a coral reef which dries in places at low water, extending for nearly  $\frac{3}{4}$  mile from the shore, in front of the village. This reef is a great inconvenience to the anchorage, which at best is but an indifferent one. From the west extremity of this reef the lighthouse bears N. 33°

E. (N. 23° E. mag.). There is a boat passage round the north end of the reef, close along the shore, where landing is easy.

**Light.**—A fixed white light is exhibited to serve as a guide to the anchorage, elevated 50 feet, and visible in clear weather 10 miles. The light is placed upon a pillar, in the form of a pyramid, which is painted white.

**Anchorage.**—The best anchorage is in 8 or 9 fathoms, with the lighthouse bearing S. 80° E. (East mag.), distant about 800 yards. The bottom inside this depth is very uneven, there being coral heads with only 4½ to 5 fathoms on them, and having depths of 7 to 9 fathoms between. It is necessary to anchor immediately soundings are obtained, as the bank is steep.

With strong westerly winds the anchorage would be very exposed, and most unsafe to remain at.

The sea breeze from the westward lasts all day, and the NE. trade or land breeze, sometimes blowing strong, all night.

**Buoy.**—A red buoy, for the local mail steamers, is moored in 6½ fathoms, about 600 yards from the shore, but it is not always in position. Vessels are not supposed to anchor inside this buoy.

**Caution.**—It is necessary to approach this anchorage with the greatest caution, as in fine, calm weather the swell seldom breaks on the reef extending from the shore off the village.

**Supplies.**—Beef may be obtained here at 6 cents a pound, potatoes are abundant, and plenty of fish may be caught with the seine.

The watering place, which is in a small, sandy bay, is only a pool of rainwater collected in a hole, and would require 500 feet of hose to pump it into a boat. In the summer the water becomes somewhat stagnant, and unfit for drinking purposes; in winter more rain falls and it then becomes a stream.

**Coast.**—From the bottom of Kawaihae Bay the coast trends for 23 miles SW. by S., to Keahole Point, the western extreme of the island, where it turns to the southeastward for 7 miles to Kailua. Along the whole of this coast there is no shelter, and the shore line has been much altered by the lava streams which have flowed from the crater of Mauna Loa.

**Kailua Bay** is a small indentation in the coast, exposed to the southward and westward, but affords good anchorage at most seasons of the year.

At the time of the visit of the U. S. Exploring Expedition in 1841, the residence of the Governor of Hawaii Island was established here. On a point on the west side of the bay is the tomb of King Kamehameha.

Rain seldom falls on this coast, except in showers, and a rainy day once in the year is looked upon as something remarkable. *This, together* with the absence of all dew, prevents the existence

of much cultivation; it affords, nevertheless, a coarse vegetation, sufficient to pasture a few hundred goats; but a mile back from the shore the surface is covered with herbage, which maintains cattle, etc.; and 2 miles in the interior there is sufficient moisture to keep up a constant verdure.

**Temperature.**—The temperature is mild and equable; during the winter the thermometer ranges from  $64^{\circ}$  to  $85^{\circ}$ , and in summer from  $68^{\circ}$  to  $86^{\circ}$ .

**Winds.**—The prevailing winds are the land and sea breezes, which are very regular; there are also strong north winds, but the most severe gales are those from the SW., which last from a few hours to two or three days, and render the anchorage unsafe.

**Directions.**—When approaching Kailua Bay, bring the summit of Hualalai, 8,275 feet, to bear N.  $66^{\circ}$  E. (N.  $56^{\circ}$  E. mag.), and steer in on that bearing; the town may be recognized by the two churches, and the cocoanut groves on the shore to the westward.

**Light.**—A small light is exhibited from a stand on the west side of the bay when the local schooners or coasting steamers are expected.

**Landing.**—There is a most convenient landing place on a sandy beach on the west side of the bay, formed by the jutting out of two points, between which is a small cove protected from the surf by some rocks.

**Coast.**—From Kailua the coast trends in almost a straight line, S. by E., 5 miles to Keauhou Bay and then continues in the same direction  $5\frac{1}{2}$  miles to Kealakekua Bay.

**Keauhou Bay**, a small indentation, affords but indifferent anchorage, and is exposed to all but easterly winds.

**Kealakekua Bay** affords the best anchorage on this coast, and lies between Keawekaheka (Lava) Point and Keei or Cocoanut Point, which are about 2 miles apart, NW. by N. and SE. by S., of one another.

The bay derives its name (path of the gods) from a slide in the hill, still visible.

The climate is mild throughout the district, the thermometer ranging from  $62^{\circ}$  to  $76^{\circ}$  in winter, and from  $70^{\circ}$  to  $86^{\circ}$  in summer. Strong winds are seldom experienced; and during the day there is a cool sea breeze which changes to the land breeze at night.

Kona, a village a few miles inland, is considered one of the most healthy spots in the whole group, and especially beneficial to people suffering from weakness or disease of the lungs or chest. Many visitors come here from California to pass the winter, and there are one or two commodious boarding houses for their accommodation.

Kealakekua Bay is well known to history as having been the scene of the death of Captain James Cook, R. N., the celebrated navigator, who was killed here by the natives on 14th February, 1779.

On the west side of Kanwalda Cove is a village of the same name, where the monument in memory of Captain Cook has been erected, but cocoanut and other trees are growing up, and the monument is not readily distinguishable from seaward. It is an obelisk on a square foundation, about 26 feet high, in latitude  $19^{\circ} 29' 03''$  N., longitude  $155^{\circ} 55' 55''$  W.

The shore all round the bay is rocky, which makes landing very dangerous when there is any swell setting in; except at Kealakekua Village, where there is a fine sandy beach, with a morai or burying place at one extremity and a small well of fresh water at the other.

**Light.**—A small light is exhibited from Cook Point when the local mail steamer is expected.

**Anchorage.**—This bay is easy of access, but the anchorage is not good, owing to the great depth of water and foul state of the bottom.

Between Cook Point and Napoopoo there are depths from 30 to 10 fathoms, bottom chiefly composed of sand and shell; in the vicinity of Napoopoo, however, the bottom is rocky.

Large vessels usually anchor in the middle of the bay, with Cooks monument bearing N.  $35^{\circ}$  W. (N.  $45^{\circ}$  W. mag.), and Coconut Point S.  $5^{\circ}$  W. (S.  $5^{\circ}$  E. mag.).

Kanwalda Cove, though exposed to winds from south and SW., may be considered a safe anchorage except during the winter months, Cook Point partially protecting the anchorage from the swell. In 1876, H. M. S. *Fantome* anchored in Kanwalda Cove in 30 fathoms water, abreast Cooks monument, mooring with a stern hawser to the shore; and during the stay of six weeks (in October and November) southerly winds were experienced only on two occasions, when a disagreeable swell set in although the wind was light; landing, however, was not interrupted.

**Directions.**—The summit of Mauna Loa, bearing East (N.  $80^{\circ}$  E. mag.), will lead to Kealakekua Bay, but should the summit of the mountain be obscured, which is often the case, the church on the slope of the hill, about  $\frac{1}{4}$  mile inside Peterel Point, is a good mark.

**Landing.**—The usual landing in Kealakekua Bay is at Kealakekua, from where a good carriage road runs up to the coffee region. It is a good landing ordinarily, but if any swell sets in from the westward boats are liable to receive injury from rocks about one to 2 feet under water near the pier.

There is a good beach upon which boats can easily land, near the south end of the high cliffs.

The landing near Cooks monument at Kaawaloa is at a small wooden pier. Boats can not go alongside the side of the pier on account of rocks, but must land at the end of the pier.

The carriage road leading to Kona is poor.

**Supplies.**—Beef, fowl, sweet potatoes, and plantains can be obtained in Kealakekua, also water at Napoopoo, a village south of Kealakekua, but the tank is falling into decay, and the water is brackish in all wells in the vicinity of Kanwalda Cove.

**Earthquake.**—On 24th February, 1877, a slight shock of earthquake was felt at Kanwalda, and steam was observed to be rising from the sea off Cocoanut Point; on visiting the spot it was found that lumps of porous lava, some nearly a cubic foot in size, were rising to the surface, whence, on the contained gas escaping, they sank again. At the time of the earthquake a crack opened in the ground from Cocoanut Point in an ESE. direction, extending for more than a mile, in some places 4 inches broad and 50 feet deep.

**Coast.**—From Kealakekua Bay the coast trends in a general southerly direction 21 miles to Ke Au o Kanewaa, and then in a curve southeastward 18 miles to Ka Lae, the south point of the island.

Almost the whole of this coast is lava. This frequently lies in large masses for miles in extent, and is in other places partially broken, exhibiting perpendicular cliffs, against which the sea dashes with fury. This formation extends  $\frac{1}{2}$  mile into the interior, and as the distance from the sea increases, the soil becomes richer and more productive. The face of the country, within this rocky barrier, is rough and covered with blocks and beds of lava, more or less decomposed, and at a distance of 2 miles from the coast begins to be well covered with woods of various kinds of trees, which are rendered almost impassable by an undergrowth of vines and ferns. In some places these strips of woods having escaped destruction, descend to within one mile of the shore. These are in no case parallel to the shore, but lie always in the direction which the streams of lava would take in descending from the mountains.

#### ALENUIHAHA CHANNEL.

This channel, which separates Hawaii from Maui and Kahoolawe Islands, is 26 miles across, and clear of dangers.

During the NE. trade the wind frequently blows through the channel with great violence, and there is also a strong current setting to the westward; those from any of the western ports of Hawaii are therefore recommended to keep close in under the lee of the island until reaching Upolu Point, when they will be enabled

to fetch across to the channel on the west side of Maui. Those from the northward, bound to Hilo, will probably find it impossible to weather Upolu Point from the west side of Maui, but on getting under the lee of Hawaii the trade wind fails until reaching the south point of the island, when they will have to beat against the wind and current along the SE. coast. A steamer would find it advantageous to round Upolu Point and proceed along the east coast of the island, as the trade wind fails when close into the point and does not blow home with any force along the whole of this shore.

#### MAUI ISLAND.

**Maui**, or Mowee, 43 miles long, WNW. and ESE., is divided into two oval-shaped peninsulas, connected by a low isthmus, 6 miles across, and only a few feet higher than the beach.

At a distance it appears like two distinct islands, but on nearer approach the isthmus is seen. The whole island, which is volcanic, was probably produced by the action of two adjacent volcanoes, which have ejected the immense masses of matter of which it is composed. The appearance of Maui resembles Tahiti more than the neighboring island Hawaii. The eastern peninsula, which is the larger of the two, is lofty, but though the mountains are often seen above the clouds, they are never covered with snow.

Although on a first view the peninsulas resemble each other, on closer examination they are found to be very different. East Maui rises in one unbroken mountain. West Maui has many sharp peaks and ridges, which are divided by deep valleys, and which, in descending toward the sea, open out and form sloping plains of considerable extent on the north and south sides. The highest peak of West Maui, Mauna Ika, is 5,788 feet in height.

The isthmus consists of sand, which is constantly shifting and thrown up into dunes. It is too dry for cultivation, but during nine months of the year it is a fine grazing country, and feeds large herds of cattle that are mostly owned by foreigners.

East Maui, though mountainous, has most cultivated land, and the rich volcanic soil of the Kula District, on the SW. side of the island, raises abundant crops of potatoes. Wheat and other grain is also cultivated.

The productions of Maui are the same as those of the other islands; to these may be added a few fruits, as grapes, etc.

**Mauna Haleakala** is somewhat like Mauna Kea, in Hawaii; the highest point, named Kolehale, is 10,032 feet above the sea, and is destitute of trees to the height of about 2,000 feet; then succeeds a belt of forest to the height of 6,500 feet, and again the summit, which is cleft by a deep gorge, is bare.

The crater of Haleakala (or house of the sun) is a deep gorge, open at the north and east, forming a kind of elbow; the bottom, as ascertained by the barometer, was 2,783 feet below the summit peak, and 2,093 feet below the rim. Although its sides are steep, yet a descent is practicable at almost any part. The inside of the crater is entirely bare of vegetation, and from the bottom arise some large hills of scoria and sand; some of the latter are of ochre-red color at the summit, with small craters in the center. All have the appearance of volcanic action, but the natives have no tradition of an eruption.

**Kanahena Point Light.**—This point is the west point of La Perouse or Keonevio Bay. On this point, from a rough wooden structure, is shown a fixed white light, 50 feet above the sea and visible 11 miles. It illuminates an arc of  $222^{\circ}$  between N.  $77^{\circ}$  W. (N.  $87^{\circ}$  W. mag.) and S.  $35^{\circ}$  E. (S.  $45^{\circ}$  E. mag.). Between N.  $55^{\circ}$  E. (N.  $45^{\circ}$  E. mag.) and N.  $10^{\circ}$  E. (North mag.), the light is eclipsed at times by some intervening part of the structure.

**Coast.**—The SW. point of Maui, Cape Hanamanioa, is formed by rugged, craggy rocks, and the sea breaks at a little distance northwestward of it. The edge of the bank is steep-to, suddenly shoaling from no bottom at 80 fathoms to 25 fathoms, and then 10 fathoms.

From Cape Hanamanioa the south coast trends E. by N. and NE. 27 miles to Alau Islet. The whole of this shore is rugged and affords no anchorage or shelter. From seaward, the land appears to ascend abruptly; it is densely covered with trees and vegetation, while here and there a few habitations appear.

**Alau Islet**, lying off the east coast of Maui, is very small, and has a reef extending about  $\frac{1}{2}$  mile to the SE. Other patches, with 3 to 5 fathoms water on them, lie south and west of the islet, distant about 400 yards.

A sunken rock, with about 8 feet on it at low water, and 13 fathoms close around, lies about  $\frac{3}{4}$  mile SE. of Alau Islet.

**Kauiki Head**, the eastern point of Maui, is an old crater which is connected by a low spit to the mainland, and at a distance appears like an island.

**Kapueokahi (Hana) Bay** is formed by Kauiki Peninsula and the islands off it, and Nanualele Point, the distance between which is only 700 yards. The anchorage is well protected from the wind and sea, and is very convenient.

**Twin Rocks**, 14 and 20 feet, lie a short distance NE. of Kauiki Head, and south of them are two pinnacle rocks, 3 and 5 feet above water, with deep water around. They are difficult to distinguish, and with the Twin Rocks obstruct the entrance to the harbor.



**Directions.**—From the southward, keep about  $\frac{1}{2}$  mile off Kauiki Head until the entrance to the harbor bears S.  $55^{\circ}$  W. (S.  $45^{\circ}$  W. mag.), then steer for the entrance on this course, keeping close to the rocks on the port hand when entering, with a storehouse down by the jetty in line with a Chinese cook shop, a short distance above it, bearing S.  $55^{\circ}$  W. (S.  $45^{\circ}$  W. mag.), and when the two black rocks off the inner point are in line N.  $80^{\circ}$  E. (N.  $70^{\circ}$  E. mag.), anchor in 5 fathoms, sand, stones, and mud.

From information obtained here, it would be better for those coming from leeward ports to take the passage west of Maui, thereby avoiding the very strong trade wind and current experienced in rounding the SE. point of Maui. Many steamers have been unable to steam against it at times.

**Anchorage.**—H. M. sloop *Sappho* anchored with the inner black rocks in line, N.  $80^{\circ}$  E. (N.  $70^{\circ}$  E. mag.); Nanualele Point, N.  $32^{\circ}$  E. (N.  $22^{\circ}$  E. mag.), and had a clear swinging berth with 30 fathoms of cable out.

The anchorage inside the two black rocks is only 200 yards wide, as a spit of lava extends into the center of the bay, forming a middle ground with only 6 feet of water over it, on which the sea generally breaks; but outside a line drawn between the inner black rocks and Nanualele Point, there is anchorage right across the bay in from 4 to 9 fathoms.

**Coast.**—From Kapueokahi Bay the coast trends WNW. 22 miles and then 9 miles WSW. to Kahului Harbor. There is no shelter or anchorage in all this distance, and the coast is fully exposed to the force of the trade wind.

The north coast of East Maui is a succession of deep ravines, which gradually diminish in breadth as they ascend, and are finally lost on the flanks of the mountains. Traveling along the coast in consequence becomes almost impossible. Cascades are seen falling in these ravines, several hundred feet in height, having, however, but little volume of water.

**Kahului Harbor**, situated between the coral reefs on the northern side of the low isthmus joining the two peninsulas, is about 700 yards wide across the entrance, and 800 yards deep, and exposed to the northward.

Kahului is an important place for exporting the produce of the northern part of Maui, and there are railways connecting it with Wailuku to the westward and Spreckelsville and Haiku on the east. In 1881, a jetty was being built out from the shore near the custom-house, which it was proposed to extend as far as the edge of the reef.

Hobrons flagstaff, near the low point NE. of the town, is in latitude  $20^{\circ} 53' 55''$  N., longitude  $156^{\circ} 27' 46.5''$  W.

**Beacon.**—A beacon stands on the west extreme of the reef on the eastern side of the harbor, SW. of which are two buoys at 100 and 200 yards respectively.

**Anchorage** may be obtained in from  $2\frac{1}{2}$  to 7 fathoms, with the shore end of the jetty bearing S.  $47^{\circ}$  E. (S.  $57^{\circ}$  E. mag.), distant 450 and 650 yards respectively.

**Tides.**—It is high water, at full and change, at 11h. 40m. Springs rise 3 to 4 feet.

**Wailuku.**—About 2 miles NW. of Kahului is the village of Wailuku, in which is the female seminary, which is an extensive range of coral buildings, situated on an inclined plane, with high and massive precipices behind.

**Coast.**—From Kahului the coast trends NW. by N. 8 miles to Kahakuloa Point, and is an abrupt precipice several hundred feet in height. At Kahakuloa Point the coast line changes its direction to the westward for another 8 miles to Hawea Point, when it curves to the southward for  $8\frac{1}{2}$  miles to Lahaina, Kekaa Point being in between.

**Napili Bay** is situated at the NW. end of Maui, where the coast line changes its direction to south. It is a small indentation between Hokuamu and Kaelekii Points, off both of which are reefs.

**Lahaina** was at one time much frequented by whaling vessels for refitting and obtaining supplies, but of late years, since the whale fishery has fallen off, Lahaina has consequently suffered, and is now only visited by vessels loading with sugar, which is grown on the estates in the vicinity.

Lahaina is built along the beach and is principally composed of grass houses situated as near the beach as possible; it has one principal street, with a few others at right angles to it. The town may be recognized by some conspicuous buildings, especially Government house, which is near the beach, and has a tall flagstaff before it.

There is an open roadstead off the town, which is completely sheltered from the trade wind by the high land of Maui; but the holding ground has been reported to be indifferent, the layer of sand being very thin with rocky ground below.

**Supplies** of all sorts can be obtained here; beef, vegetables, fruit, and water in abundance.

**Landing.**—The landing place is at a small pier, extending from the lighthouse, and protected by a breakwater.

**Light.**—From a small wooden structure at inshore end of small wharf near the courthouse, two fixed white lights are exhibited, visible about 6 miles. They are placed horizontally 4 feet apart, but can not be distinguished as separate lights until within  $1\frac{1}{2}$  miles of the anchorage.

**Buoy.**—A mooring buoy for steamers lies about 480 yards S. 64° W. (S. 54° W. mag.) from the courthouse flagstaff.

**Directions.**—In making Lahaina Anchorage vessels should not approach the shore nearer than 2 miles until the lighthouse bears N. 49° E. (N. 39° E. mag.). Then, in day time, steer in with the flagstaff and the north window of Government house in range, until Olowalu Point is in line with Millers Hill, the hill on the west point of East Maui. Anchor in 12 fathoms, mud bottom.

At night steer in with the light bearing N. 49° E. (N. 39° E. mag.), sounding until 12 fathoms is obtained.

**Tides.**—The tide at Lahaina is irregular, being somewhat dependent on the winds; it runs to the NW. generally sixteen hours out of the twenty-four.

**Lahainaluna.**—The most remarkable building to be seen as the roadstead of Lahaina is approached is the seminary of Lahainaluna, which was established in 1831, situated on the side of the mountain that rises behind Lahaina ("luna" meaning "above").

**Coast.**—From Lahaina the coast trends to the SE. about 10 miles to Kamalalaea Bay. The southern side of West Maui has a forbidding appearance; the shores, however, are not so steep and rocky as elsewhere, and have generally a sandy beach.

There is a roadstead here called Patoa by Vancouver, which is represented as a good anchorage, and may be easily found by attending to the following description: "The large bay, formed by the two peninsulas and the sandy isthmus, has its western side formed by high, rocky precipices, that rise perpendicularly from the sea. To the westward of these precipices the coast is chiefly composed of sandy beaches, and the mountains at some distance from the shore form two remarkable valleys, separated from each other by a high, rugged mountain, seemingly detached from the rest, and approaching nearer to the beach than those to the left and right of it. The anchorage at Patoa is abreast the easternmost of these valleys, which appeared fruitful and well cultivated."

**Kamalalaea Bay** is the large bay on the SW. side of Maui, between the two peninsulas, the western side of which is formed by rocky cliffs and precipices. Nearly in the middle of the western side is a village called Mackerrey by Vancouver, off which there is anchorage in 7 fathoms, sand and broken coral, a little more than  $\frac{1}{4}$  mile off shore.

The soundings on the eastern side of the bay are regular, but very rocky.

Near the head of this bay, in the NE. corner, is the small village Maalaea, where there are some houses for storing sugar.

Besides sugar, there is a great quantity of wheat, maize, and potatoes grown in this district; and supplies of fresh provisions

are obtained plentifully from Wailuku, which is about 6 miles distant.

**Anchorage.**—The anchorage off this place is not good, as the trade wind blows across the low isthmus in heavy gusts, and communication with the shore by boats is sometimes interrupted.

There is a small pier here for loading and unloading schooners, and boats can always go alongside, the channel leading to the landing place between two coral reefs being about 20 yards wide.

A spar buoy is moored in 6 fathoms, near the anchorage, for the use of the local mail steamers, but it is recommended not to be used, as the chain is small, and has been down a long time.

Care must be taken when entering to keep the buoy well on the starboard bow; the water shoals gradually if not too near the western shore.

A good anchorage may be picked up in 9 fathoms, sand, with the pier head N. 9° N. (N. 19° W. mag.); west point of bay, S. 68° W. (S. 58° W. mag.).

**Coast.**—From Maalaea the coast trends S. by E. 9 miles in almost a straight line to Makena, near the SW. extreme of the island.

**Makena**, or Makees landing, is a small indentation near the southwestern extremity of the island, and derives the latter name from a planter whose estate is situated on the side of Mauna Haleakala, on a plateau 2,000 feet above the sea, and about 5 miles east of the landing place.

Makena may be recognized from seaward by Pau Olai (Round Hill), 355 feet high, with a flagstaff on its summit, and situated about one mile south of the landing; on a nearer approach, the stone church and several houses near the landing place will be seen.

Off the landing place there are two mooring buoys for the trading schooners; the inner buoy lies in 5 fathoms and the outer in 8 fathoms.

**Anchorage.**—The anchorage is exposed to the heavy squalls which occasionally blow over the low isthmus in the center of Maui; and landing is at times impracticable for ship's boats, owing to the heavy surf. The holding ground also is not good, and vessels have sometimes dragged in the squalls.

The anchorage is in 10 to 12 fathoms, sand, about 600 yards from the landing place. From this position the depths gradually decrease to 3 fathoms near the shore.

**Molokini** is a small, barren island, lying 2½ miles W. by S. from Makena. Lying almost in the middle of the channel between East Maui and Kahoolawe, it would prove a dangerous obstacle to navigation were it not so much elevated above the sea as to be at all times visible from vessels passing between the islands. The island has a reef extending 400 yards from its NW. extreme.

This island is visited only by fishermen, who dry their nets on its barren surface.

#### KAHOOLAWE ISLAND.

**Kahoolawe**, or Tahuruwa, which is separated from East Maui by Alalakeiki Channel, 6 miles wide, is about 11 miles in length, NE. and SW., and 7 miles wide. It is low, and almost destitute of every kind of shrub or verdure, excepting a species of coarse grass. The rocks of which it is formed are volcanic, but nothing is known of any active or extinct craters on the island; and, from its shape and appearance, it is not improbable that it once formed a part of Maui, from which it may have been detached by some violent convulsion connected with the action of the adjacent volcanoes of Maui or Hawaii.

This island is now chiefly useful as a sheep run, the soil of decomposed lava being of too poor a quality for cultivation.

**Shoal.**—Off the SW. extremity, Kealaikahiki Point, is a shoal which was seen by Cook on his discovery of the island. In 1841 it was examined by Wilkes, who found it much nearer the land than was anticipated. This shoal extends  $1\frac{1}{2}$  miles from the point, and has  $1\frac{1}{4}$  fathoms of water over it. A berth of 3 miles should be given the point in passing.

#### LANAI ISLAND.

**Lanai**, or Ranai, lying 16 miles NW. of Kahoolawe, and separated from West Maui by Auau Channel,  $7\frac{1}{2}$  miles wide, is a dome-shaped island, 15 miles long, NW. and SE., and 10 miles broad. It appears to have been frequently rent, large fissures being apparent in its sides.

The center of this island is much more elevated than Kahoolawe, but is neither so high nor broken as any of the other islands. Great part of it is barren, and the island in general suffers much from the long droughts which prevail; the ravines and glens, notwithstanding, are filled with thickets of small trees. The island is volcanic, the soil shallow, and by no means fertile; the shores abound with shellfish.

Near the shore, on the west side, are some rocks named the Five Needles, which are about 120 feet in height.

The southern shore of Lanai is usually avoided by masters of vessels acquainted with the navigation among these islands, on account of the light and variable winds or calms generally experienced there; the trade wind being interrupted by the high land of Maui and Lanai.

It is not unusual for vessels to be becalmed here for six, eight, or even ten days. The natives, in the small craft belonging to the

islands, usually keep close inshore, avail themselves of the gentle land breeze to pass the point in the evening, and run into Lahaina with the sea breeze in the morning; but this is attended with danger, as there is usually a heavy swell rolling in toward the land.

#### MOLOKAI ISLAND.

**Molokai**, or Morotoi, is situated north of Lanai, from which it is separated by Pailolo Channel,  $6\frac{1}{2}$  miles wide.

It is apparently formed by a chain of volcanic mountains, about 35 miles long, east and west, and 8 miles broad. The mountains are high and broken by deep ravines and watercourses, the sides of which are clothed with verdure, and ornamented with shrubs and trees. One-third of the island, toward the west end, is a barren waste, not susceptible of cultivation, except in the rainy season; it has, in consequence, but few inhabitants, who are engaged mostly in fishing. The eastern two-thirds is almost one entire mountain, rising gradually from the south, until it attains an elevation of 2,500 feet, while on the north it is almost perpendicular.

On the south side there is a narrow strip of land, not exceeding  $\frac{1}{4}$  mile in width, and here dwell the greater part of the population; the soil is very rich. Owing to the want of moisture, however, few plants will thrive even here; resort is therefore had to the uplands, which are found to be susceptible of the highest degree of cultivation.

**Lae o Ka Laau**, the SW. extremity of Molokai, is a low black point, in latitude  $21^{\circ} 06' N.$ , longitude  $157^{\circ} 18' W.$  A reef which breaks heavily extends 800 yards westward of the point.

**Light.**—From a white lighthouse on Lae o Ka Laau, a fixed white light is exhibited, elevated 50 feet above the sea, and visible in clear weather from a distance of 11 miles.

**Coast.**—On the south side of the island there are several small harbors within the reef, the best of which is Kaunakakai, situated 16 miles east of Lae o Ka Laau.

**Caution.**—The south coast of Molokai should not be approached at night without local knowledge, as the reef which fringes the shore is steep-to, and extends seaward in some places to a considerable distance.

**Kaunakakai** is situated midway between the two extremes of Molokai, and from it the west extreme of Lanai Island bears S.  $10^{\circ}$  W. (South mag.).

From Lahaina, Molokai has the appearance of being two islands, the lowest land not being visible; a course steered for this apparent channel will lead direct to Kaunakakai.

No supplies are to be obtained at Kaunakakai.

**Light.**—A small harbor light is maintained at Kaunakakai harbor.

**Anchorage.**—There is an outer and inner anchorage at Kaunakakai; the former is not good, owing to the uneven nature of the bottom, and the latter affords but a limited space.

**Buoy.**—There is a mooring buoy in the inner anchorage.

**Directions.**—When approaching the outer anchorage bring the leading marks in line N. 35° E. (N. 25° E. mag.), and anchor in from 7 to 8 fathoms, rock and sand, near the spar buoy. This mark also leads in mid-channel to the inner anchorage; these posts may be easily identified by having a lantern on each, from which lights are exhibited when the mail steamer is expected. The outer light is white, and the inner light red.

**Tides.**—High water, full and change, 3h. 20m.; rise 2½ feet.

**Kamalo Harbor**, 5 miles eastward of Kaunakakai, is merely a reef harbor, with 2 fathoms on the bar.

**Tides.**—Same as at Pukoo Harbor.

**Pukoo Harbor** is a very confined reef harbor, with from 3 to 5 fathoms in it, situated about 5 miles eastward of Kamalo.

**Directions.**—There are two posts on shore on which lights are shown; these in line N. 33° W. (N. 43° W. mag.), lead into the harbor. Anchor on this line of bearing. A jetty is proposed.

**Tides.**—High water, full and change, 3h. 15m.; rise 2½ feet.

**Coast.**—From Pukoo Harbor the coast trends NE. 9 miles to Halawa Point, the east extreme of Molokai. About 2 miles south of this point is a small, rocky, barren islet, named Mukuo Niki.

From Halawa Point the north coast trends west 13 miles to a peninsula which projects about 2 miles from the coast on which is the leper reservation for the Hawaiian Islands.

**Kalanao** is situated near the center of the north coast of Molokai, at the base of very precipitous mountains. The leper establishment was erected here about 1865, and since its erection, and the consequent separation of the victims of this terrible disease from the healthy inhabitants of the islands, the spread of the malignant malady has been arrested, and is now much on the decrease.

The anchorage is to the southward of a long, low point, extending from the foot of two remarkable steep mountains; it can not, however, be considered safe, being exposed to the heavy swell that occasionally sets in.

A red buoy has been moored here in 13 fathoms for the local mail steamer, which, if brought in line with the church on a S. 80° E. (East mag.) bearing, will lead to the best anchorage, in 13 to 16 fathoms, dark sand.

H. M. sloop *Peterel* anchored here in 13½ fathoms, with the church bearing S. 87° E. (N. 83° E. mag.); North Point, N. 17° E. (N. 7° E. mag.), about 100 yards west of the buoy.

Landing at Kalanao, always difficult, is at times dangerous, and no supplies can be obtained.

**Coast.**—From the peninsula the coast trends 15 miles westward to Lae o Ka Ilio, the NW. extremity of the island, and then turns to the southward for 8 miles to Lae o Ka Laau; between these two points a commodious bay has been stated to exist, but the whole intermediate space is nearly a straight shore, composed alternately of rugged rocks and sandy beaches. In 1793 Vancouver anchored for the night in 19 fathoms water, sandy and bad holding ground; when working up, the soundings were pretty regular from 17 to 60 fathoms, fine sandy bottom; the anchorage was within a mile of the breakers, Lae o Ka Laau bearing S.  $10^{\circ}$  W. (South mag.), distant 4 miles, and Lae o Ka Ilio, N.  $36^{\circ}$  E. (N.  $26^{\circ}$  E. mag.), about the same distance. This position is as close as vessels can lie with safety, as this side of the island is exposed to North and NW. winds. and to a heavy sea that is almost constantly rolling from that quarter on the shore, which makes landing almost impracticable.

#### OAHU ISLAND.

**Oahu**, lying WNW. of Molokai and separated from it by Kaiwi Channel, 22 miles in breadth, may be considered the principal island of the group, as it contains the port chiefly frequented by the shipping of the North Pacific, and is also the seat of government.

This, the most fertile of the Hawaiian Islands, is about 40 miles long, NW. and SE., and 20 miles broad, resembling in the varied features of its natural scenery several of the Society Islands. Its appearance from the anchorage off Honolulu is remarkably picturesque; a chain of lofty mountains rises near the center of the southeastern part to a height of 3,105 feet, and descends near the middle of the Island into Ewa Plain, which divides it from the distant and elevated mountains that rise in a line parallel with the western shore.

Ewa Plain is nearly 20 miles in length, from Pearl River to Waialua, and in some parts 9 or 10 miles across; the soil is fertile, and watered by a number of rivulets which wind their way along the deep watercourses that intersect its surface and empty themselves into the sea.

The whole island is volcanic, and in many parts inactive craters of large dimensions may be seen, the best known of which are Diamond and Punch Bowl Hills, near Honolulu; but from the depth of mold with which they are covered, and the trees and shrubs with which they are clothed, it may be presumed that many ages have elapsed since any eruption took place.



The plain of Honolulu exhibits in a singular manner the extent and effects of volcanic agency ; it is not less than 9 or 10 miles in length, and, in some parts, 2 miles from the sea to the foot of the mountains; the whole plain is covered with a rich alluvial soil, in places 2 or 3 feet deep; beneath this, a layer of fine volcanic ashes and cinders extends to the depth of 14 or 16 feet; these also lie upon a stratum of solid rock, by no means volcanic, but evidently calcareous, and apparently a kind of sediment deposited by the sea, in which branches of white coral, bones of fish and animals, and several varieties of marine shells have been found.

A number of wells have been dug in different parts of the plain, in which after penetrating through the calcareous rock, sometimes 12 or 13 feet, good clear water has been always found; the water in all these wells is perfectly free from any salt or brackish taste, though it invariably rises and falls with the tide, which would lead to the supposition that it is connected with the waters of the adjacent ocean, from which the wells are distant from 100 yards to  $\frac{1}{2}$  mile.

**Makapuu Point**, the eastern extremity of Oahu, is a rocky bluff, in which are numerous caves, the mouths of which are at two-thirds the height, and are accessible by ascending along the side of the bluff obliquely. These caves were formerly used by the natives as burial places; they are the effect of volcanic action, and called Kaualahu.

**Light.**—It is proposed to establish a light on this point.

**Coast.**—The NE. side of the island, when viewed from seaward, appears to be formed of detached hills rising steeply from the sea, with rugged and broken summits; the hills are covered with wood, and the valleys between them are fertile and well cultivated.

The coast from Makapuu Point to the Mokapu Peninsula trends NW. for 10 miles, and off it are some scattered islets and rocks, some of which are as much as one mile from the shore.

Lying about one mile north of the eastern extreme of Mokapu Peninsula are some rocks named Moku Manu.

Between Mokapu Peninsula and Kaoio Point, 8 miles to the NW., is a deep indentation or bay, which is almost completely blocked by reefs and shoals.

Kaneohe, in the Kulau District, is the principal place on this side of the island, and is just beneath the Pali of Nuuanu, at the back of Honolulu.

The climate is cooler here by a few degrees than that of the opposite or leeward side of the island, and frequent showers keep up a constant verdure.

From Kaoio Point the trend of the coast is NW. for 14 miles to Kahuku Point, the northern extreme of the island, which is low

and flat, and has a reef extending off it to a distance of  $1\frac{1}{2}$  miles or more.

Along this coast there is a narrow strip of land, varying from  $\frac{1}{2}$  to 2 miles in breadth, which is only a few feet above the level of the sea, and very fertile, and has a gradual ascent to the foot of the precipices.

The scenery of this district is hardly to be surpassed in beauty, boldness, and variety; stupendous precipices rising some 2,000 feet and more, with small streams rushing over and down their sides.

From Kahuku Point the coast turns SW. for 11 miles to Waialua, where there is a large village, and at about one mile from the shore there are regular soundings of from 13 to 20 fathoms.

This coast, from Kahuku Point to Waimea, is a level plain about 6 miles by 2, but slightly elevated above the sea, and merely a good pasture. At many of the frequent holes and crevices in it, may be seen streams of fine clear and cool fresh water, making their subterranean way, 3 or 4 feet below the surface, from the mountains to the outlets in the sea below low water mark.

**Laie Bay** is a narrow indentation in the coral reef about 5 miles SE. of Kahuku Point. There is a Mormon settlement here, but there are many dangerous rocks and rocky ground in the approach and it should be avoided.

**Waimea Bay** is a slight indentation in the coast, about 4 miles NE. of Waialua, and was visited by the *Resolution* and *Discovery* in 1779, shortly after the death of Captain Cook; they anchored in 13 fathoms, sand, with the extreme points of the bay bearing S.  $72^{\circ}$  W. (S.  $62^{\circ}$  W. mag.) and N.  $75^{\circ}$  E. (N.  $65^{\circ}$  E. mag.), and the mouth of a river S.  $41^{\circ}$  E. (S.  $51^{\circ}$  E. mag.), distant one mile.

In the bight of the bay, southward of the anchorage, there is rocky foul ground 2 miles from the shore; and there is no landing on the coast to leeward, on account of a coral reef which stretches along the shore to a distance of  $\frac{1}{2}$  mile.

**Waialua** lies at the northern end of the plain which separates the two ranges of mountains, at the foot of the Konahaunui or eastern range of mountains, while the northern slope of Kaala, the western range, nearly reaches it.

The coast here forms a small bay, and has a dreary aspect on first landing. The soil is sandy and poor; but a short distance inshore an agreeable change takes place.

It was near this place that Mr. Gooch, the astronomer to Vancouver's expedition, and Lieutenant Hergest were killed by the natives, in 1792.

**Lights.**—Two lights are shown which in line S.  $45^{\circ}$  E. (S.  $55^{\circ}$  E. mag.) lead in clear of the reef, but close to the northern coral reef of the harbor on which is Whale Rock.

**Tides.**—It is high water, full and change, at 3h. 40m.; rise 2 to 3 feet.

**Coast.**—From Waialua the coast trends west for 9 miles to Kaena Point, the western extreme of the island, which stretches out in a long narrow point.

From Kaena Point the general trend of the land is SE. by S. for 20 miles to Laeloa or Barbers Point, the SW. extreme of the island. This side is principally composed of steep craggy mountains, some descending abruptly to the sea, others terminating at a small distance from it; thence a low border of land extends to the shore, which is formed by sandy beaches, bounded by rocks on which surf breaks heavily.

**Mauna Kaala**, 4,030 feet high, which overlooks this coast, has the appearance of being a flat-topped mountain; but such is not the case, the evenness of the ridge alone giving it that appearance.

**Waianae.**—Nearly in the middle of this side of the island is Waianae Village, in the neighborhood of which the bases of the mountains are farther from the shore, and a narrow valley, presenting a fertile and cultivated aspect, seems to separate and wind some distance through the hills. The shore here forms a small sandy bay, and on the southern side between two high rocky precipices, in a grove of cocoanut trees, is situated the village.

In the center of the bay, about one mile north of the village, is Lahilahi, a high rock, remarkable for its projecting from a sandy beach; at a distance it appears to be detached from the land. Between this and the high rocky point to the southward of the village is a bank of soundings that extends some distance to seaward. On the south side of this bank the soundings are irregular, from 8 to 25 fathoms, rocky bottom; but to the north of it, near the rock, no bottom was obtained with 100 fathoms of line, though not more than  $\frac{1}{4}$  mile from shore. This was found to be the case also a little to the southward of the bank.

**Light.**—When a steamer is expected a light is shown on end of the point south of the town.

**Tides.**—It is high water, full and change, at 3h. 45m.; rise  $2\frac{1}{2}$  to 3 feet.

**Barbers (Laeloa) Point**, the SW. extremity of Oahu, extends in a long, narrow spit.

**Light.**—A fixed white light is exhibited from a lighthouse on Barbers Point. The light is elevated 43 feet above the sea and is visible 10 miles. The tower is built of coral, and the lantern is painted red.

**Coast.**—From Barbers Point the coast trends ENE. 8 miles to the entrance of Pearl River. The shore is low and flat, covered with bushes and scattered tufts of grass, and fronted by a coral reef from which the soundings gradually deepen to seaward.

**Pearl (Puuloa) River and Lochs** is a large, irregular-shaped lagoon or inlet, greatly cut up by projecting points and islands, and the water of which is somewhat freshened at its inland extremities by the streams that run into it.

Its name is derived from the circumstance that the pearl oyster is found here, and it is the only place in these islands where it is found.

This inlet has somewhat the appearance of a lagoon that has been partially filled up by alluvial deposits, and is connected with the sea by a narrow channel 2 miles in length, named Pearl River, the entrance to which is through a break in the coral reef 5 miles westward of Honolulu.

There is a bar at the entrance of this channel on which the depth was 12 feet in 1887, and would thus appear to be slowly silting up, as in 1841, when it was surveyed by the U. S. Exploring Expedition, the least water obtained was 15 feet.

The channel across the bar is not difficult to distinguish, on account of the discolored water on either side. After passing the bar the depth of water becomes ample for large vessels.

On the west side of the channel is Puuloa Village, in the neighborhood of which are large salt works; and near the entrance, on the eastern side, is a large yellow building, called Queen Emma's house, but which is not easy to recognize.

The extensive flats between the Pearl Lochs and the sea are generally dry and barren, being great stretches of clinkers, with here and there a deep pit or crevice; scattered bushes and a small amount of grass afford pasture for a few cattle that are kept there.

Along the inshore side of the Pearl Lochs is a strip of very fertile land of variable breadth, part of which is under cultivation; behind this the land rises gradually to Ewa Plain.

**Wind.**—In the summer the NE. trade wind blows fresh in Pearl Harbor, the strongest in July and August; it is felt most in the East Loch, but does not blow there to interfere with the anchorage or with the use of boats; at the other anchorages it is very little felt. The East Loch Anchorage is too far inland to be affected materially by the wind from any other direction, though in the winter the "Kona" wind sometimes blows with great force.

**Currents.**—There is very little current in Pearl Lochs. Observations made at Puuloa gave a strength of about  $\frac{1}{2}$  knot on the ebb tide and less on the flood.

**Water.**—At present the only place where fresh water can be obtained is at Pearl City; at this place the water is piped down from a mountain reservoir; it is understood that the amount is limited but can probably be increased. The sugar plantations north and

west of Pearl Harbor procure their water from artesian wells, and it has been determined by actual boring that a great artesian basin underlies at least that part of the island; when bored too near the shore line the water is usually more or less brackish from the seepage through the rocks.

**Directions.**—The leading marks at present used for crossing the bar are the high windmill frame at Puuloa, slightly open to the eastward of the meeting of the high land of the Waimea Mountains with the flat neck of Ewa Plain below it. The change in color of the water will tell when over the bar. At present no direction other than the careful use of the chart can be given for entering the harbor.

**Anchorage.**—Good anchorage may be had outside the bar by the careful use of the lead; it is not well to go inside 10 fathoms. The anchorages inside the lochs are of small extent, and the channels are generally too narrow to admit of anchorage with vessels of any size.

**West Loch.**—The anchorage in the West Loch is a small basin, about 650 yards in diameter, inside the 18-foot curve and lying just west of Hanalua Point. The water to the head of the loch, about a mile above the anchorage, shoals gradually; in the anchorage from  $3\frac{1}{4}$  to  $5\frac{1}{2}$  fathoms may be found.

**Middle Loch.**—The anchorage in Middle Loch is about 400 yards in extent inside the 18-foot curve, and is situated close to Pearl City Peninsula. The anchorage is in about  $4\frac{1}{2}$  fathoms. From the 18-foot curve to the head of the loch is about  $1\frac{1}{4}$  miles.

West of Ford Island, a vessel might anchor in the East Branch.

**East Loch.**—The anchorage north of Ford Island is good in 4 to  $5\frac{1}{2}$  fathoms. It is about a mile long by  $\frac{1}{2}$  mile wide. It is the largest and best anchorage in Pearl Harbor.

**Coast.**—About 2 miles to the eastward of the Pearl Lochs, and 3 miles NW. of Honolulu, is a remarkable circular salt-water lake, about  $\frac{1}{2}$  mile in diameter, so impregnated with salt that twice every year the natives take out large quantities of fine, hard, clear, crystallized salt, which furnishes a very valuable article of commerce.

Between Pearl River and Honolulu Harbor, at about one mile westward of the latter, is a gap in the coral reef named Kalihi Entrance; but it only leads on to the coral flat, which is very extensive hereabouts, and is only fit for canoes.

**Honolulu**, the capital and principal port of the Hawaiian Islands, is situated on a narrow plain at the foot of the eastern range of mountains. The city has grown rapidly in importance and appearance, and being in the track of vessels between America, China, and Australia, affords a convenient stoppage place.

The aspect of the country around Honolulu, as seen from the roads, is barren, and the plain on which the town stands is destitute of verdure. This plain extends both east and west from the city, while behind it the land rises gradually toward the Nuuanu Valley. Several crater-shaped hills are in sight, one of which, named Puowina or Punch Bowl Hill, 498 feet in height, lies close to the NE. side of the city.

The central part of the city consists of regularly laid-out streets, on either side of which stand residences and warehouses constructed after the European style, generally painted, and frequently placed within spacious inclosures with gardens, while the outer portions or suburbs are still chiefly composed of grass huts inhabited by the natives. Amongst the principal buildings are the fine and spacious Government houses, in which all the public offices are inclosed. The palace, a fort, two hospitals, several churches and chapels belonging to the different religious denominations, a customhouse, sailors' home, and several schools, some of which for the natives are with compulsory education, which system has had the most satisfactory results, as the increased knowledge of the inhabitants testifies.

The population is on the increase, and in 1896 numbered 29,920.

**The Climate** of Honolulu is generally very pleasant and healthy, especially when the NE. trade wind prevails, but the southerly and southwesterly winds are called by the natives the "sick winds," because they are followed by small ailments, gastric maladies, and intermittent fevers, as is the case with the *sirocco* in Europe.

**Supplies.**—Fresh meat is plentiful, of good quality, and reasonable in price. Fruit is plentiful and inexpensive. Vegetables are abundant and cheap. Manufactured ice plentiful. Water is plentiful and good; it costs  $\frac{1}{2}$  cent a gallon on the wharf and  $1\frac{1}{2}$  cents delivered alongside, in the harbor; more when delivered outside. By the ton, \$1.26 at wharf, \$2.52 alongside. Steam water boat.

**Coal.**—The amount of coal varies with the season, but is never scarce. The prices vary, Newcastle N. S. W. coal costs, on shore, from \$8 to \$9; Departure Bay, B. C., from \$10 to \$11; Welsh coal, from \$12 to \$15. Ships are coaled at wharf or by means of lighters. Depth at wharf 27 feet.

**Port Charges.**—Entrance fee, \$1; clearance, \$1; manifest, \$1; stamps and stamped paper, \$7; the tonnage tax is included in harbor master's and pilotage fees. Light dues, \$3; buoy dues, \$2; harbor master's dues, \$6; wharfage, 2 cents per ton per day; shifting rates, \$3 each time; port physicians charge for boarding outside of harbor, \$25; in the harbor, \$15; alongside of wharf, \$10; bill of health, \$1.

Vessels in ballast or distress are not relieved from any dues; vessels calling for orders and not coming inside the harbor pay only entrance and clearance dues.

**Pilots** usually board vessels between Diamond Head and the outer buoy, and under orders from the harbor master they moor vessels; it is not always open to pick your own berth.

**Pilotage** is not compulsory, but vessels entering or departing without a pilot must pay half pilotage. Rates, in or out, the same. Mail steamers of 1,000 tons and upward, \$50; transient steamers, \$75; war vessels, \$2 per foot when pilot is taken; sailing vessels under 200 tons, \$1.50 per foot; other vessels and steamers per ton, 5 cents; for detention of pilot, \$7 per day; no vessels are exempt from pilotage except men-of-war and coastwise vessels.

**Towage** is not compulsory; rates as follows: Under 200 tons, \$30; between 200 and 300 tons, \$35; 300 and 500 tons, \$40; 500 and 800 tons, \$45; 800 and 1,000 tons, \$50; 1,000 and 1,200 tons, \$60; 1,200 and 1,400 tons, \$75; over 1,400 tons, 5 cents per registered ton over and above 1,400. Towage outside of pilot limits as per agreement.

**Hospital.**—There is a good general hospital, to which sailors and others are admitted on payment of \$1.25 per diem.

The quarantine hospital is on the west side of Honolulu Harbor on ground reclaimed on the coral reef.

**Repairs.**—There are foundries, workshops, and shipyards, where considerable repairs can be effected.

There is a patent slip with a capacity of about 1,200 tons; charges the first day are 30 cents per ton (including hauling up); 15 cents per ton for ten days; beyond that, as may be agreed upon. There are heaving-down facilities, the charges are \$15 per day for over-seeing and gear. Divers and material may be had at \$35 per day.

**Communication.**—The Royal mail line of steamers running between San Francisco and Auckland, New Zealand, and Sydney in Australia call here once a month each way, remaining in harbor for six daylight hours; the line consists of two English and two American steamers. There is also a monthly steamer from San Francisco, which arrives on the intermediate fortnight, and waits at Honolulu for a week, so that the return steamers both leave within a few days of each other. There are also steamers to Yokohama and Hongkong occasionally.

Communication between the islands is kept up by two or three small, but effective steamers.

**Outer Anchorage.**—Outside the reef and a short distance to the eastward of the entrance to the harbor, anchorage may be obtained in about 10 fathoms, but the holding ground is not good, as the bottom is hard sand and coral and very uneven. Although

this anchorage is safe during the summer, when the trade wind is steady, it is not advisable to use it during the winter, when the winds are variable, and squalls from the southward with a heavy sea are not uncommon.

**Honolulu Harbor** is formed by an opening in the coral reef, about 150 yards wide at the entrance, and 300 yards wide off the town, and rather more than one mile in length; but though small, it is capable of accommodating a good many vessels by mooring them head and stern, the smooth water inside enabling them to secure close to one another.

**Bar.**—The bar has been dredged to 30 feet for a channel 200 feet wide; inside the bar there is ample water, and the head of the harbor has been dredged to 27 feet, where several wharves have been constructed,

**The Time Signal** is a whistle, which is sounded twice daily by electric signal from the survey office, but is not reliable for chronometer correction.

The standard time for the Hawaiian Islands is that of the meridian  $157^{\circ} 30' W.$ , or 10 hours and 30 minutes slow of Greenwich mean time.

**Lights.**—Near the edge of the western reef of the channel leading into Honolulu Harbor, at 1,200 yards from the entrance, stands a lighthouse, painted white, erected on piles, from which, at an elevation of 26 feet, a fixed red light is exhibited, visible 9 miles, between the bearings of  $S. 80^{\circ} E.$  (East mag.) and  $N. 47^{\circ} W.$  ( $N. 57^{\circ} W.$  mag.).

Near the customhouse, on the east side of the harbor, a green light is exhibited at an elevation of 47 feet, and should be visible 5 miles. When the electric lights of the town are lighted, this green light will be operated at an elevation of 60 feet.

These two lights are  $\frac{1}{2}$  mile apart, and in line bearing  $N. 25^{\circ} E.$  ( $N. 15^{\circ} E.$  mag.) lead over the bar.

**Buoys and Beacons.**—The fairway bell buoy off the entrance is painted red and white.

The entrance to the channel is marked on the western side by a white can buoy surmounted by a black disk, moored in shallow water; and on the eastern side by a red iron spar buoy, also moored in shallow water. The channel is marked by 5 red buoys on the eastern side and 8 piles on the western side; these in addition to the above entrance buoys.

Vessels should not pass between the two red buoys at the entrance to channel, but west of the westernmost.

There is a hauling out and mooring buoy painted red off the wharves, at the head of the harbor, also two opposite the P. M. S. S. Co.'s wharf.



When the mail steamer is expected the buoys in the channel are lighted with lanterns.

**Tides.**—It is high water, full and change, at Honolulu, at 3h. 40m.; springs rise 2 to 3 feet. The tidal streams are regular, running 6 hours each way, the flood to the westward.

**Directions.**—When approaching Honolulu from the eastward, the truncated conical crater of Diamond Hill, with its lighthouse, comes prominently into view, and is an excellent landmark. If from north of Malokai, Koko Head is the most prominent landmark. Shape a course to pass at least one mile to the southward of Diamond Head, and when it is abeam, steer N. 46° W. (N. 56° W. mag.), when the fairway buoy should soon appear directly ahead. If intending to anchor outside the reef, the best place is in the vicinity of the fairway buoy.

When approaching Honolulu at night, intending to anchor outside, use the leading lights in line bearing N. 25° E. (N. 15° E. mag.), and be most attentive to the soundings, obtaining bottom under 40 fathoms; do not come into less than 12 fathoms before anchoring.

When crossing the bar, the deepest water is not found with the lights in line, but nearer the west side of the channel, with the harbor lighthouse bearing N. 28° E. (N. 18° E. mag.); on this bearing not less than 30 feet will be found at mean low water. The buoys and beacons mark the channel in.

Vessels are anchored and the stern hauled in to the ledge NW. of the lighthouse by means of chains to anchor on the ledge. In the event of a strong southerly breeze rendering it necessary to cast off the stern mooring, an anchor should be dropped under foot before swinging off into the harbor.

Those leaving Honolulu under sail, either for the northward or eastward, are recommended to shape course about S. 55° W. (S. 45° W. mag.) for 30 miles or more, before hauling up to the northward, so as to keep in a belt of wind which blows through the *pali* over Honolulu, and leads into the true trade wind. By keeping close inshore, vessels will probably be becalmed for some time; merchant vessels trading between Honolulu and San Francisco generally leave with yards squared, until they pick up the trade clear of the influence of the island.

**Coast.**—From the entrance of Honolulu Harbor, the coast trends in a curve for 4 miles SE. to Leahi or Diamond Head, and is fronted by a coral reef, which extends in some places  $\frac{1}{2}$  mile from the shore.

**Leahi or Diamond Hill** is an inactive crater with rugged edges, 761 feet high, and about  $\frac{1}{2}$  mile in diameter at its summit, lying  $3\frac{1}{2}$  miles SE. of Honolulu. It is highest toward the water, then slants down and back, and drops suddenly into a low plain that extends back to the mountains.

**Signal Station.**—A signal station, consisting of a square white building with flagstaff, is situated on the southern slope of Diamond Hill, 120 feet above the sea. All vessels are signaled to Honolulu as soon as sighted.

**Light.**—An open framework tower has been erected about 250 yards west of the signal station. From this tower is shown a fixed white light with two red sectors. It shows white over an arc of  $184^{\circ}$  and red over an arc of  $13^{\circ}$  on each side of the white sector. It is elevated 147 feet and should be visible 20 miles. (Building.)

**Waikiki** is a village lying about a mile NW. of Diamond Hill; there is anchorage in front of it, which is occasionally used, but not recommended, as the sailing vessels sometimes compelled to bring up there almost always lose their anchors.

Between Honolulu and Waikiki there is a vast collection of salt-ponds, which at one time produced large quantities of salt, but are not worked now and are being filled in.

**Coast.**—From Diamond Head the land trends away ENE. about 7 miles, and then turns to the southward to Koko Head, which lies 6 miles East (N.  $80^{\circ}$  E. mag.) from Diamond Head, and is formed of barren rocky cliffs, rising so suddenly from the sea that to all appearance a vessel might pass close to them. The bay between these points is apparently shoal and rocky, and the surf breaks violently on the beach, behind which is a lagoon.

Koko Head is the most prominent object visible in approaching the island from the eastward, northward of Molakai. From Koko Head the coast trends NE. 4 miles to Makapuu Point, the east point of Oahu Island.

#### KAUAI ISLAND.

**Kauai**, or Atooi, lies 64 miles WNW. of Oahu, and is separated from it by the Kaieie Waho Channel. This island is of volcanic formation, somewhat circular in shape, 28 miles long, east and west, and 23 miles wide, and rises in the center to a peak 5,000 feet in height.

Kauai was the first island of the group that was visited by Cook, in January, 1778, and he was much struck by the care with which the natives managed their plantations. From seaward, the NE. and NW. sides appear broken and rugged, but to the south the land is more even, the hills rise with a gentle slope from the shore, and at some distance back are covered with wood. The highest point of the island is named Waialeale, 5,000 feet high, and it is said that there is a crater on the summit.

This island is considered one of the most pleasant of the group, portions of it appear better adapted to agriculture than the other

islands, and the coffee and sugar plantations on the weather side, which is well watered with streams and frequent rains, are very productive, but the lee side is dry and adapted to cultivation only in the valleys.

**Makanuena**, the southern point of the island, is a bold, bluff, barren, high, rocky headland, falling perpendicularly into the sea, with a remarkable dome-shaped mountain a short distance to the northwestward of it.

From here the coast trends NE. for 7 miles to Kawai Point, the southern point of Nawiliwili Bay. This part of the island is well watered, and a heavy sea rolls in on the shore.

**Nawiliwili Harbor** is a small cove or indentation on the SE. side of the island, at the head of Nawiliwili Bay, situated between Carter and Ninini Points, which lie 1,600 yards apart, and afford anchorage in from 6 to 8 fathoms, with tolerable protection from the trade wind. The harbor is about 1,400 yards deep in an east and west direction, but the greater part of it is blocked by shoals and reefs.

There is a large village at Nawiliwili, and the soil in the vicinity is rich, producing sugar cane, taro, beans, sweet potatoes, etc.

A spit, with from one to 3 fathoms over it, on which the sea always breaks, projects 800 yards from the south shore near Carter Point in a northerly direction, leaving Middle Channel rather more than 200 yards broad, and having a depth of 4 fathoms between its extremity and Kuku Point on the north shore. This channel leads to the southward, between the spit and the shore reefs, to an inner harbor in the SW. corner of the bay, where there are from 2 to 4 fathoms water.

**Boat Landing.**—There is a substantial wharf in the NW. corner of the harbor, where landing may be easily effected; but it should be approached with caution, as a reef extends from the shore to the southward of it for 400 yards in an easterly direction.

**Buoy.**—A red buoy is moored off the end of the reef extending from the NW. shore, south of the wharf.

**Caution.**—Boats, after rounding Kuku Point, should stand well to the northward of the red buoy before making for the landing, as the reef extends beyond the line from the buoy to the wharf.

**Carter Point** is a high, steep bluff with high, steep hills immediately back of it.

**Ninini Point** is low and gradually sloping and is now a sugar plantation. It terminates in bluffs 30 to 40 feet high.

**Light.**—A fixed white light is shown on Ninini Point from a wooden framework tower surmounted by an inclosed lantern painted white. It is elevated 70 feet and should be visible 10 miles.

**Anchorage.**—A good anchorage with fair holding ground will be found in 6 fathoms off a small sand patch about 400 yards NW. of Ninini Point. It is the only sand patch in sight and is a little to the southward of the line joining Ninini and Kuku Points.

**Steamer.**—A small steamer carrying the mail leaves Honolulu every Tuesday for Kauai ports, returning to Honolulu on Sunday. The steamer touches at Nawiliwili, Hanamaulu, Koloa, Eleele, and Hanapepe.

**Telephone.**—There is telephone communication between all the principal towns and plantations on the island; the central office is at Lihue. No cable communication.

**Hanamaulu Bay** is 2 miles northward of Nawiliwili; it is small and almost filled by a shoal extending from a small stream at its head and is open to the eastward.

**Wailua.**—From Ninini Point the coast trends north for  $5\frac{1}{2}$  miles to Wailua, which is situated on a small river of the same name, in a barren, sandy spot, though the surrounding district is extremely fertile, and was formerly a place of some importance.

The river, in common with all those along this coast, is closed at the mouth with sand bars, but inside it is deep and navigable by canoes for several miles.

In 1880 a small steamer was observed secured to a buoy off Wailua, apparently inside a reef, as breakers were observed all around to seaward.

**Coast.**—From Wailua the coast turns outward again for 6 miles NNE. to Kanala Point. It appears to be free of outlying dangers, and at a distance of one mile from the shore no soundings could be obtained with the hand lead. Sugar cane appears to be cultivated along this coast in large quantities, especially in the vicinity of Wailua and Kanala Point, where there are several sugar factories.

Kanala Point, the NE. extreme of the island, is a low rounded point projecting into the sea from a very remarkable forked hill, which is nearly detached from the rest of the connected mountains of the island.

From Kanala Point the coast trends round in a curve to north and west for 14 miles to Hanalei Bay, and has several small villages scattered along it, near the mouths of mountain streams which are closed by sand bars. The land near the sea is flat and very fertile, but soon rises to the mountains behind. The rivers as well as the sea abound in fish, which afford a plentiful harvest to the fishermen.

**Hanalei Bay**, situated on the north side of Kauai, is semicircular in shape, and lies between two conspicuous bluff heads which

can not be mistaken, and is about one mile wide at the entrance and nearly the same in depth; but the whole of this area is not anchorage ground, the shores being fringed with a reef which, on the east side (opposite the mouth of the river and the bluff northward of it) there is a spit, over which there is about 9 feet water, with detached heads, extending 600 yards from the beach.

The bay is easily entered, and tolerably spacious, but completely exposed to winds from North and NW., gales from which quarter send in a very heavy sea.

Hanalei is situated near the bottom of the bay, and the scene from the anchorage is very picturesque; the mountains rise to a height of from 3,000 to 4,000 feet, and are clothed with verdure from base to summit, with numerous rills coursing down their precipitous sides. In front of the town is a good beach where great quantities of fish may be caught with the seine.

The district derives its name (land of rainbows) from the numerous rainbows formed by passing showers, and the rains are so frequent as to clothe the country in perpetual green.

On the eastern side of the entrance is a conspicuous, dark bluff head, with two sandy beaches a short distance to the eastward; this bluff is the termination of a large green ridge, which is high inland and gradually slopes to the sea, ending in a bluff point about 50 feet high. This bluff head should be given a wide berth, as a reef extends from it for about 600 yards.

A short distance to the southward of this bluff is the mouth of the Hanalei River, in front of which is a bar which may be crossed by boats at half flood, and inside the bar carries a depth of from 6 to 4 feet, and is navigable, for boats drawing 3 feet, for several miles. About 800 yards from the mouth of the river, on the northern bank, is a large farm, called Charlton Farm, which keeps a number of cattle of good breed.

Waiali River empties through a bar of shifting sand, at the head of Hanalei Bay.

Black Head, on the west side of entrance, is a black rocky ledge about 15 to 20 feet high, with a high green hill back of it on which a few trees are growing. There are patches of quicksand on the beach on the western side of the harbor. During a NW. gale the sea breaks violently clear across the entrance to the harbor.

Na Pali Point, just west of the entrance to the bay, is the termination of some high land which slopes suddenly to the sea; some parts of the slope are jagged, forming several needle peaks; and on the extremity of the point there is a small hill which appears detached when first seen on approaching the bay from the eastward; a reef extends about  $\frac{1}{2}$  mile from Na Pali Point.

**Landing.**—The boat landing is a short distance up the Hanalei River, near the Roman Catholic Church.

**Supplies** are plentiful: beef, vegetables, and fruit may be obtained in abundance. Water may be procured by sending boats into the river, which is easy of access in fine weather, and a short distance from the mouth the water is perfectly fresh.

**Directions.**—From a distance out at sea the shore line (especially in the morning and during any of the frequent rains which occur around Hanalei) is indistinct. A remarkably shaped double peak or niche in the high mountains back of Hanalei, on a bearing S. 23° E. (S. 34° E. mag.), will lead into the harbor.

**Anchorage.**—The depth of 20 fathoms is  $1\frac{1}{2}$  miles from the shore, and at the entrance to the bay depths of 7 to 9 fathoms will be obtained. The anchorage ground in the bay, in fine weather, is spacious, but there is only room for about three vessels in bad weather under the lee of the reef near the eastern point of the bay. A good berth will be found in 6 fathoms, with the bluff at east entrance to harbor bearing N. 28° E. (N. 17° E. mag.) and the large white house with flagstaff S. 52° E. (S. 63° E. mag.). During NW. gales the sea breaks violently across the entrance to the harbor, and it would be inadvisable to attempt to enter, or ride out a gale in the harbor.

**Currents.**—Currents set to westward during the NE. trades and to the eastward after their cessation. This current carries back and forth with it a large patch of sand, so that at some periods of the year portions of the coast are sandy and suitable for boat landing and at other times rocky.

**Coast.**—From Hanalei Bay the coast trends 4 miles to the westward to Haena Point; thence in a general direction SW. by W. for 9 miles, and then SW. by S. for  $8\frac{1}{2}$  miles to Mana Point.

The NW. coast of Kauai, forming the district Na Pali, has a very rugged appearance, rising to lofty abrupt cliffs that jut out into a variety of steep, rocky points, destitute of both soil and verdure, but terminating nearly in uniform even summits, on which, as well as in the valleys or chasms that are formed between them, are small patches of green. Here and there a stream, running from the lofty mountains behind, finds its way to the ocean.

**Mana Point**, the west extreme of Kauai, is a long, low sand spit commencing at the foot of a high range of mountains. A reef extends off the point for about  $\frac{1}{2}$  mile, besides which there are some outlying rocks.

**Coast.**—From Mana Point the coast trends SSE. for 4 miles to Konole Point, and from thence E. by S. for 5 miles to Waimea, and is fronted by a coral reef extending some distance from the shore.

In 1876, soundings in 6 fathoms were obtained from H. M. S. *Myrmidon*, when off Konole Point, whilst running along the coast at  $\frac{1}{2}$  mile from the breakers; on hauling out from the shore, the soundings gradually increased. This coast is open and exposed, and a heavy surf rolls in on the beach.

Between Mana Point and Waimea the coast consists of a sandy plain, from  $\frac{1}{4}$  to one mile wide, and 150 feet above the sea; thence it rises gradually to the mountains. It has a sunburnt appearance, and is destitute of trees, except on the low grounds where the coconut tree thrives and bears abundance of fruit. The sea along this shore abounds in fish.

**Waimea Bay**, on the SW. side of Kauai, affords the best anchorage around the island, except in the months of January and February, when the trade winds are interrupted, and SW. winds sometimes blow strongly and directly on shore.

Waimea Village derives its name from a river, which after a course of about 15 miles falls into the sea at this place. It is at the eastern end of a long brown barren hill, where it breaks abruptly, forming the Waimea Valley.

A brown church, a short distance up the hill, is a good mark in going in. The church nearly in range with the end of the pier, the church open a little to the left, will lead into the anchorage.

The large brick smokestacks at Kehaha to the westward and Makawili to the eastward are good landmarks.

The sugar mill shown at Waimea, on the chart, has two black iron smokestacks. The old Russian fort is difficult to make out, it being about the same color as the surroundings and nearly demolished. There is a cocoanut grove near the mouth of the river on the western bank. The boat landing is at the pier. The harbor is shoaling as the sand is continually washing in. The pier had to be lengthened about 150 feet in order to obtain good water at the end.

About one mile west of Waimea is the spot where Cook's boat first landed on the discovery of the Hawaiian Islands. As far as Cook sounded he found that the bank has a fine gray sandy bottom, free from rocks, except a little to the eastward of the village, where a shoal projects, on which are rocks and breakers, but not far from the shore.

This anchorage would be entirely sheltered from the trade wind if the height of the land did not alter its direction, and make it follow along the coast; so that it blows from NE. on one side of the island and SE. or ESE. on the other, falling obliquely on the shore, and often raising a surf which renders landing at times very unpleasant, and sometimes impracticable. Southerly storms known as "*Konas*" occasionally occur from November to March, rendering the anchorage very unsafe and landing impracticable.

Waimea Bay should be approached with caution, as reefs extend to southward and WSW. from the center of the bay. With the church bearing N.  $11^{\circ}$  E. (North mag.), the soundings when obtained will decrease gradually, and with the church bearing N.  $25^{\circ}$  E. (N.  $14^{\circ}$  E. mag.), a good berth will be found in 8 fathoms, about  $\frac{1}{2}$  mile off the end of the pier.

**Makawile**, about one mile eastward of Waimea, has good anchorage in  $7\frac{1}{2}$  fathoms, one mile from the pier. There is better landing than at Waimea, and the local steamers call at Makawile in preference.

**Coast.**—Hanapepe is situated in a small valley about  $5\frac{1}{2}$  miles southeastward of Waimea; 3 miles eastward of it the shore line consists of reddish bluffs. At Wahiawa, about 4 miles east of Hanapepe, there is a small crater near the beach and a short distance above it a conical hill. A rock with 7 feet water over it lies about one mile off shore at Wahiawa.

From Hanapepe east the land is not under cultivation to any extent until Kaloa is reached, 7 miles from Hanapepe. **Makanuena Point**, eastward of Kaloa, is the south point of Kauai, and has a remarkable dome-shaped peak a short distance northward of it.

**Kaloa Bay**, about one mile from the south point of Kauai, is a slight indentation of the coast, where there is a considerable village of the same name, off which anchorage may be obtained, but in a very exposed position.

The country round Kaloa is much broken by hills and inactive craters; but the soil is good, though dry and very stony, and is capable of cultivation in many places. There is a sugar plantation here, and several large cattle ranches in the vicinity. Near the beach are two inactive craters.

The village may be recognized by many high buildings and two churches, and extends from the beach to a distance of 2 miles up the slope of the hill; also by a low point with a sandy patch on its western side, situated between the village and Makanuena, the south point. From this low point a rocky ledge extends a short distance, and somewhat protects the anchorage.

There is a good landing place at Kaloa in a small cove protected by a reef extending about 200 yards from the shore; an artificial creek has been made at the head of this cove, with sufficient space for a boat to enter.

Supplies of beef, vegetables, and fruit may be obtained in abundance.

**Anchorage.**—A berth will be found in about 11 fathoms, sand and shell, with the western church bearing N.  $18^{\circ}$  E. (N.  $7^{\circ}$  E. mag.); the low point S.  $83^{\circ}$  E. (N.  $86^{\circ}$  E. mag.); dome-shaped mountain N.  $55^{\circ}$  E. (N.  $44^{\circ}$  E. mag.).



It may be mentioned that from a position about one mile south of Makanuena, the most western point in view will be observed to have a black lava wall crossing it from east to west, and that the anchorage off Kaloa is about  $\frac{1}{2}$  mile west of this point. This part of the coast appears to be fringed by a rocky ledge, but may be safely passed at one mile distant.

#### NIIHAU ISLAND.

**Niihau** lies 17 miles W. by S. of Kauai, from which it is separated by Kumukahi Channel, and is about 16 miles in length, and 6 miles broad.

This island is mostly low land except on the eastern side, where it rises directly from the sea to a height of 1,500 feet, and is rocky and unfit for cultivation. On the western side is a level plain from 2 to 4 miles in width, where the natives cultivate yams, fruits, sweet potatoes, etc. The natives are few in number and very poor, and live almost entirely on the western side of the island.

The eastern shore of Niihau is rocky and wholly destitute of shelter or anchorage; but on the western shore there are several open roadsteads where anchorage may be obtained, though very exposed.

**Coast.**—Cape Kawaihoa, the south point of the island, terminates in a round hill. From here the coast trends in a bight for 8 miles NE. to Pueo Point, near the middle of the east side, over which rises the highest point of the island. From Pueo Point the coast continues to the northward for 6 miles to Oku Point, the NE. extremity.

**Lenua, or Egg Island**, off the north point of Niihau, is a small, rugged, barren rock, apparently destitute of soil, and without any sign of habitation. It is separated from Niihau by a channel about one mile wide, in which the depth appeared irregular and, therefore, it is not recommended.

**Coast.**—From the north point of Niihau the west coast trends in a general direction SW., for 12 miles, to Kona Point, which is a long, low, sandy point, having a rock 10 feet above water near it, and a reef which extends a short distance outside the rock. Off the point breakers extend for nearly  $1\frac{1}{2}$  miles.

**Yam Bay** is an open roadstead about  $1\frac{1}{2}$  miles south of Kona Point, where, in fine weather, anchorage may be obtained. The soundings are regular, with a sandy bottom.

There is only one place in the bay where boats can effect landing with safety when the sea sets in, which is a common occurrence; this is on the northern side, behind a small reef of rocks that lies a little way off the beach, and even here it is necessary to guard *against* sunken rocks.

Vancouver anchored here in 18 fathoms, with Kona Point bearing N. 36° E. (N. 25° E. mag.), distant 1½ miles.

**Cook Anchorage**, on the SW. side of Niihau, is about 4 miles south of Kona Point, and is exposed to the heavy northwesterly swell which frequently sets in, and breaks some distance from the shore; the bottom is composed of large rocks, with patches of sand in some places. Near the beach are a few huts, a church, and a derrick for loading and unloading boats.

**Directions.**—If bound to Cook Anchorage from the northeastward, it is recommended to pass north of Lenua Island, and keep along the western shore of Niihau, as the trade wind blows more from the northward on this side of the island.

Lenua Island may be rounded at ¼ mile, and the western shore of Niihau, which appears tolerably bold, may be passed at a distance of about 2 miles. The reef which extends off Kona Point should not be approached nearer than ¾ mile, when probably soundings will be obtained in 13 to 15 fathoms, deepening again to no bottom at 20 fathoms. When the huts at the landing place at Cook Anchorage bear East (N. 79° E. mag.), they may be steered for, the soundings decreasing gradually to 12 and 9 fathoms.

**Anchorage.**—In 1875, H. M. sloop *Peterel* anchored in 9 fathoms, sand and rock, with Kaula Rock bearing S. 56° W. (S. 45° W. mag.); extreme of reef off Kona Point N. 19° E. (N. 8° E. mag.); church N. 72° E. (N. 61° E. mag.).

**Landing.**—The landing place is protected by some rocks forming a breakwater in the NE. part of the bay, and is situated just inside a lava patch, which from seaward appears like a point; landing can be effected easily in moderate weather, but with a heavy swell it is impracticable.

**Supplies.**—The sheep are bred here for wool only, so that very little meat can be procured, and only a limited quantity of vegetables or fruit is to be obtained.

Fresh water can only be procured during the rainy season, when the water courses are full; at other times of the year there is no water but what the natives have collected in wells in the rock for their own use; these are chiefly near the south end of the island.

**Caution.**—As the rollers set in with but little warning at Cook Anchorage, sailing vessels should proceed to sea on the first indications of them. On these occasions the fishermen who go out for only a few hours are sometimes unable to land on their return, and have to go round to the other side of the island. These rollers generally last from three to four days.

**Coast.**—From Pahau Point, the SW. point of Niihau, the coast, which is much indented, trends ESE. for 3½ miles to Cape Kawaihoa.

In 1792 Vancouver anchored off the coast in 14 fathoms, bottom soft and sandy, about  $\frac{3}{4}$  mile from the shore; with the wind well from the northward this is not a bad anchorage, as the swell does not set in so much as it does on the western side of Niihau.

**Kaula**, or Tahura, lying nearly 20 miles WSW. of Cape Kawaihoa, is a small elevated barren rock, destitute of vegetation and uninhabited. It is visited to collect the eggs of the sea birds which abound here. Landing can only be effected in the calmest weather, as the surf breaks heavily on the shore at all times.

**Modu Manu, or Bird Island**, in latitude  $23^{\circ} 05' 50''$  N., longitude  $161^{\circ} 58' 17''$  W., was discovered on 13th April, 1789, by Captain Douglas, of the *Iphigenia*, and is situated 120 miles NW. by W. of Niihau.

It is a barren island 903 feet high,  $\frac{3}{4}$  mile long and  $\frac{1}{2}$  mile broad. The north, east, and west sides are precipices, but on the south side there are three small bays; the two eastern have a boulder beach, where landing has been effected in the summer. The beach of the western bay is sand.

The island is bold all round, and the resort of numerous sea birds, which led to the belief that guano might exist; but from the formation of the rock and the large amount of heavy rain that falls in the vicinity, it is not possible for any quantity to accumulate.

**Anchorage** could probably be obtained at any time on the lee side about  $\frac{1}{2}$  mile off shore, in depths of 14 to 20 fathoms, on a bottom of sand and broken coral.

**Bank**.—The island stands on an extensive bank, with depths of 25 to 35 fathoms; on the NE. side it was traced for 14 miles, and no dangers were seen. The U. S. S. *Yorktown* obtained a sounding of 47 fathoms with the island bearing S.  $45^{\circ}$  W. (S.  $34^{\circ}$  W. mag.), distant 11 miles.

#### OUTLYING ISLANDS AND REEFS.

**Johnston Island** was discovered, in 1807, from H. M. S. *Cornwallis*, and named after the captain of that ship, and examined in 1859 by Lieut. J. M. Brooke, of the U. S. schooner *Fenimore Cooper*. He landed and obtained good observations, which placed the flagstaff on the western islet in latitude  $16^{\circ} 44' 48''$  N., longitude  $169^{\circ} 30'$  W. It is described as being a lagoon island, the reef being, according to an examination made from H. M. S. *Champion* in 1892, about 8 miles long in NE. and SW. direction, and the island can only be approached on a N.  $24^{\circ}$  W. (N.  $34^{\circ}$  W. mag.) bearing; anchorage was found in  $6\frac{1}{2}$  fathoms  $\frac{3}{4}$  mile from the western or largest island on the above bearing.

On the reef are situated two islets, the larger being  $\frac{1}{2}$  mile long ENE. and WSW., the smaller, a mere sand bank, about  $\frac{1}{4}$  mile in diameter. Breakers extend to the northward nearly  $1\frac{1}{2}$  miles, and a bank surrounds the reef, extending in a southeasterly direction 5 or 6 miles, with depths of 5 to 10 fathoms, but many shoaler patches were seen.

**Landing.**—The landing is bad, but small boats can reach the beach at high water.

**Reported Reef.**—Captain F. Herriman, of the schooner *Novelty*, reports that May 21, 1897, when about 12 miles N.  $77^{\circ}$  E. (N.  $67^{\circ}$  E. mag.), from the east end of Johnston Island, he obtained a sounding of  $5\frac{1}{2}$  fathoms, rocky coral bottom. The bottom was visible for half an hour after taking this sounding, during which time the schooner made 2 miles N.  $10^{\circ}$  E. (North mag.). Light breakers were seen about 3 miles to the eastward, during the time the vessel was passing over the reef.

Approximate position of  $5\frac{1}{2}$  fathoms, latitude  $16^{\circ} 48' N.$ , longitude  $169^{\circ} 15' W.$

**Schjetman Reef.**—Captain Schjetman, of the Norwegian ship *Anna*, reported that on October 19, 1868, he passed a breaking coral reef, level with the surface, at a distance of  $\frac{1}{2}$  mile in latitude  $16^{\circ}.08' N.$ , longitude  $178^{\circ} 58' W.$ , which appeared about  $1\frac{1}{2}$  miles long north and south, and about  $\frac{1}{2}$  mile wide.

In 1880 it was not seen in this or any other position by the U. S. S. *Alert*.

**Krusenstern Rock**, discovered by Captain Lisiansky and placed in latitude  $22^{\circ} 15' N.$ , longitude  $175^{\circ} 37' W.$ , is stated to have a bank around it, stretching north and south about 2 miles, on which the sea broke in one place. The above position is considered to be doubtful.

Captain R. Suffern, of the bark *Craigernë*, reports that on June 25, 1897, his ship was in latitude  $22^{\circ} 15' N.$ , longitude  $175^{\circ} 37' W.$ , the reported position of Krusenstern Rock. The weather was clear and the sea smooth, but no indications of either rock or shoal water were seen from the masthead.

#### ISLANDS AND DANGERS WESTWARD OF HAWAIIAN ISLANDS.

The following islands, rocks, and shoals, extend in a long line westward of the Hawaiian Islands for a distance of 1,350 miles and more. They have seldom been visited, and, therefore, there may be many dangers yet undiscovered.

**Frost Shoal**, about 90 miles WNW. of Bird Island, has, so far as known, a least depth of 12 fathoms on it. The bank is of considerable extent and until further investigation is made, vessels

should avoid the position given of the shoalest water. The U. S. S. *Yorktown* obtained 12 fathoms with the hand lead, the vessel going very slow, in latitude  $23^{\circ} 45' N.$  and longitude  $163^{\circ} 25' W.$

**Necker Island**, in latitude  $23^{\circ} 35' 30'' N.$ , longitude  $164^{\circ} 39' 58'' W.$ , was discovered by La Perouse in 1786. It is a small rocky island about 1,350 yards long and 250 yards wide between extremes.

The profile or plan of the island is undulating at the top, there being four distinct risings or peaks. The western peak is 280 feet in height, the next 300 feet, next 280 feet, and the most easterly 240 feet. These peaks, whose tops are comparatively flat, are connected by a ridge.

The sides of the island are all steep, but the south, the west, and NW. sides are in parts perpendicular, and in parts the cliffs overhang from 10 to 20 feet above the water line. All surfaces are rugged, uneven and weatherworn. The only exceptions are in seven or eight ancient artificial terraces on the above-mentioned rises.

One of these terraces measures 48 by 30 feet, the others about 20 by 8 feet.

The floors of these terraces are mostly paved with pebbles and small stones, and are partly encircled by upended blocks of lava measuring 24 by 12 by 6 inches, and partly by low walls 2 feet high and 3 feet thick.

The shores of the island, excepting in East Cove, are steep to, having depths of 5 to 8 fathoms alongside the rocks.

From the west end of the island a semi-detached rock, about 100 feet high, extends in a northeasterly direction for 270 yards. It is connected with the island by a short and narrow neck of rock 15 yards wide, which is almost undermined by the sea. The cliff overhangs this neck in a dangerous manner. There is also a small detached rock close to the east end of the island.

There are three species of dwarf shrubs growing in patches on the upper ridges, but there is little soil.

A few heavy showers of rain fell daily during the 14 days' stay in September of H. M. S. *Champion*, and from the fact that though there are thousands of birds there is little or no deposit of guano, it is evident that the rainfall is large.

In a cave at the east end of the island a few water drips were found. The water was clear and good. To insure a constant supply of drinking water it would be necessary to have a condenser.

**Tide and Current.**—The rise and fall was estimated at 2 feet. The current in the vicinity runs to the westward on the north side and, circling round, it eddies to the eastward on the south side of the island.

*At slack water* these currents slacken, but are not reversed.

**Formation.**—The island is of volcanic origin, lavas of various descriptions lying in beds, and dipping at the east end; all much weathered and pitted with cavities.

**Bank.**—The bank extends from the island 19 miles NE., 33 miles SE., 9 miles SW., and 8 miles NW. Sand, coral rock, and coral bottom. Depth from  $13\frac{1}{2}$  to 21 fathoms throughout.

**Anchorage.**—There are depths of from 8 to 17 fathoms, rock and sand,  $\frac{1}{2}$  mile from the shore all round the island.

**West Cove.**—Landing anywhere is impracticable with even a moderately long ground swell, such as was running from the northward for three days after the arrival of the *Champion* on August 28th.

West Cove is the best landing place for boats or telegraph cable, but to make landing practicable in all weather it would be absolutely necessary to construct a breakwater extending from the west point of the detached rock to afford shelter from the north (as the wind seldom blows from the westward). The breakwater would probably have to extend at least 400 feet in a southwesterly direction in 6 or 7 fathoms.

On the south side of West Cove, 60 feet up the cliff, pools of salt water clearly point out that a very heavy sea sometimes rolls in.

September is said to be the calmest month in the year, and strong North to NE. winds are said to be frequent during the other months.

The landing is on a ledge of hard rock from 3 to 4 feet wide and 30 feet long, on the south side of the cove; a small iron pier, with a crane, might be constructed here.

From the ledge referred to, a rough, ancient pathway leads up to the top of the cliff.

About 30 or 40 feet up the pathway there is a spot where, without much labor, a level of 24 by 12 feet might be formed, and a hut built.

**East Cove.**—Landing was practicable though difficult in East Cove on the third day after the arrival of the ships, when the northerly swell had moderated, and when West Cove was still impracticable.

At first glance it would appear that East Cove is by far the best for a pier, etc., but the argument against it is as follows:

It is open to the prevailing trade winds, which frequently are very fresh from NE., and these are accompanied by a heavy sea which piles up by reason of the formation of the island, and made worse by the heavy back wash, breaks heavily outside of, and on the bar.

**French Frigate Atoll**, lying 90 miles west of Necker Island, was discovered by La Perouse in 1786, the day after leaving Necker

Island. This dangerous and extensive shoal is a crescent-shaped atoll, on which are 16 islets or sand banks and one principal island; the points of the crescent are NW. by N. and SE. by S. from the principal island, and about  $12\frac{1}{2}$  miles apart.

The island, in latitude  $23^{\circ} 46' 00''$  N., longitude  $166^{\circ} 17' 45''$  W., is 180 feet long, 45 feet wide, and 120 feet high, rising to a ridge in the center, and so steep and rugged as to be almost inaccessible; it may be seen from a distance of about 8 miles, and resembles a brig under sail.

This island was reported to have extensive deposits of guano, which led to its being visited by Captain Brooks, of the *Gambia*, in 1859, but, finding none there, he left a party of 20 men on the island while he proceeded to explore the islands to the westward; during the summer months these men subsisted very comfortably on fish, turtle, fowls, and eggs, and water was obtained by digging a well on the largest sand bank about 600 yards from the beach, and 8 to 10 feet deep; the water was somewhat brackish, but found to answer the purpose very well. These men collected a considerable quantity of seal skins, seal oil, sharks' fins, etc.

This shoal is generally avoided, as several wrecks have occurred on the reef.

Vessels of any size can approach the island within 200 yards and may anchor anywhere inside the reef in from 3 to 14 fathoms. The bottom is composed of coral patches and sand.

Entering from the south side, the central island bearing N.  $5^{\circ}$  W. (N.  $17^{\circ}$  W. mag.), will lead clear of all dangers, and when up to the island, on the western side, a N.  $39^{\circ}$  W. (N.  $51^{\circ}$  W. mag.) course leads clear past the NW. horn. Proceeding across the shoal from south to north, the soundings vary between 12 and 17 fathoms, and the bottom from broken shell, sand, and coral to rock, sand, and coral.

There is no danger outside the line of breakers; and the current was observed to be running to the SW. at the rate of about 2 knots per hour.

**Brooks Shoal.**—In 1859 Captain Brooks, after running 30 miles N.  $56^{\circ}$  W. (N.  $68^{\circ}$  W. mag.) from French Frigate Atoll, crossed a bank with 14 fathoms over it, and saw the bottom distinctly.

**Gardner Island**, in latitude  $25^{\circ} 01'$  N., longitude  $168^{\circ} 01'$  W., was discovered by Captain Allen, of the whaler *Maro*, in 1820. It is an inaccessible rock about 170 feet high and 200 yards in diameter, with a smaller rock close to the SW. extreme, from which a reef extends about  $\frac{1}{2}$  mile.

A bank, with from 17 to 20 fathoms water, surrounds the rock, extending westward about 5 miles, and SW. more than 8 miles.

**Maro Reef**, the center of which is in latitude  $25^{\circ} 30' N.$ , longitude  $170^{\circ} 36' W.$ , was discovered by Captain Allen, of the whaler *Maro*, in 1820, and is a dangerous shoal about 30 miles in circumference, consisting of small detached patches of coral and sand, which are covered with breakers, the heaviest being near the NW. end.

At times the breakers are very light, being scarcely distinguishable from sea caps, so that great caution is necessary when approaching it. In clear weather it may be seen from aloft a distance of 5 miles.

The reef is nearly surrounded by a bank on which are soundings of from 10 to 30 fathoms, extending from 2 to 7 miles, and deepening gradually from the reef.

The reef is sunken to the westward, where there is good anchorage.

**Dowsett Reef.**—On 4th July, 1872, the whaling brig *Kamehameha* struck on a reef about 13 miles south of Maro Reef.

It extends NW. and SE. about 8 miles, and is about 4 miles broad. In some parts the reef is awash and the sea breaks all over it.

**Laysan Island**, in latitude  $25^{\circ} 48' N.$ , longitude  $171^{\circ} 44' W.$ , is a small, low island about 2 miles long and  $1\frac{1}{2}$  miles wide, 20 feet high, covered with shrubs, and inclosing a lagoon one mile or more across.

The island is surrounded by a reef which extends for about  $\frac{1}{2}$  mile, outside of which is a bank 5 miles wide, with from 14 to 19 fathoms over it. Inside the reef there is a boat passage nearly all round the island.

It is reported that no dangers exist beyond the line of breakers. Boats may effect landing in safety anywhere except on the South and SE. sides. Good anchorage may be obtained on the west side; the best, however, is about  $\frac{1}{2}$  mile from the SW. point, in from 8 to 12 fathoms, coral bottom.

In 1859 there were five palm trees on the island, about 15 feet in height. Water of tolerable quality may be obtained by digging to a depth of 2 feet. The island abounds in sea fowl, and eggs of many kinds are abundant. Turtle and fish are numerous, and easily taken.

Mr. F. P. Jameson, master of the *L'Avvenire*, reports having visited Laysan Island in April, 1894. A tower 50 feet high then stood on the middle of the western side. A considerable quantity of plant for working guano was seen, and stores of all descriptions, but no people living there.

**Lisiansky Island**, lying 116 miles N.  $83^{\circ} W.$  (S.  $85^{\circ} W.$  mag.) of Laysan Island, was discovered by Captain Lisiansky, of the



Russian ship *Neva*, in 1805. It is a small low coral island, about 6 miles in circumference, 40 feet in height, and overgrown with grass; the center is in latitude  $26^{\circ} 00' N.$ , longitude  $173^{\circ} 50' W.$

The island is encircled by a reef which, on the west side, forms a lagoon  $2\frac{1}{2}$  miles wide, in which there is a good anchorage in from 4 to 12 fathoms; the entrance to the lagoon is marked by two heavy breakers, north and south from one another,  $\frac{3}{4}$  mile apart and about 2 miles from the island; between these two breakers are several small rocks nearly awash, which may be avoided by conning from aloft; inside the lagoon are a number of scattered rocks, but as the water is smooth they are easily avoided.

The approach should be made from the north, as a low and dangerous reef extends to the southward for nearly 7 miles, and in moderate weather the breakers on it can scarcely be distinguished from sea caps. A reef extends for  $1\frac{1}{2}$  miles SE. by S., on which the *Neva* struck.

Near the south end of the island is the basin of what was once a lagoon, but is now overrun with weeds, etc. A plentiful supply of water may be obtained by digging a few feet. Birds, fish, and turtle abound.

**Pearl and Hermes Reef**, lying 155 miles NW. of Lisiansky Island, is an extensive atoll about 40 miles in circumference, 16 miles long, and 9 miles wide, on which are scattered twelve small islands and islets, forming a crescent which is open to the NW.

This atoll was discovered in 1822 by two whalers, the *Pearl* and *Hermes*, which were wrecked near the eastern end on the same night, within 10 miles of each other.

Inside the lagoon, the only entrance to which is on the NW. side, there is anchorage in from 3 to 15 fathoms, but the islands can not be approached within 2 miles; the largest island bears S.  $61^{\circ} E.$  (S.  $73^{\circ} E.$  mag.) from the entrance, and is covered with grass and low trees.

Southeast Island is in latitude  $27^{\circ} 47' 50'' N.$ , longitude  $175^{\circ} 51' 00'' W.$

There is anchorage outside the reef in from 8 to 12 fathoms, but the best is on the NW. side near the entrance. The reef is steep to on the east side, the 100-fathom line being within 300 yards of the reef; but on the west side the water runs off shoal for a considerable distance to 35 fathoms, thence it deepens very suddenly. There are no known dangers outside the breakers.

Turtle are abundant, and quantities of excellent fish may be obtained.

**Gambia Bank** was discovered by Captain Brooks, of the *Gambia*, in 1859. It lies about 35 miles WNW. of Pearl and Hermes Reef, with 14 fathoms water over it, and bottom distinctly seen; this places it in latitude  $28^{\circ} 07' N.$ , longitude  $176^{\circ} 38' W.$

**Midway Islands**, lying about 75 miles WNW.  $\frac{1}{2}$  W. of Pearl and Hermes Reef, were discovered by Captain Brooks, of the *Gambia*, in 1859, who took possession of them for the United States, and they have since been utilized by the Pacific Mail Company, who intended to form a depot here for their trans-Pacific steamers, instead of using Honolulu.

The reef encircling Midway Islands is 18 miles in circumference and without an opening, except on the western side. At the NW. point is a small patch of breakers, a few detached rocks, and then commences a compact coral wall, about 5 feet high and from 6 to 20 feet wide, which continues for  $4\frac{1}{4}$  miles to the southward and eastward, when it loses its uniformity of surface and presents a line of detached rocks, very little more than awash, for  $2\frac{1}{2}$  miles to the southward; there, off the center of the eastern island, the rocks dip under water, but reappear 2 miles to the westward, whence they again show as a continuous wall for about  $4\frac{1}{2}$  miles to the westward and northward, ending there and forming the south side of the entrance to Welles Harbor.

This entrance is about  $\frac{3}{4}$  miles broad, and from its northern side to the NW. rocks there is a bed of coral with from one to 16 fathoms, showing above water in one place, with occasional breakers.

The northern, eastern, and southern portions of the reef are steep-to, to the rocks. The bottom is visible in two places only, near the NE. and SE. points, where the soundings are shown on the chart.

**Eastern Island** is at the SE. extremity of the reef,  $1\frac{1}{4}$  miles in length and  $\frac{1}{2}$  mile wide, from 6 to 15 feet high, and covered with coarse grass and small shrubs; the beach of coral sand is of dazzling whiteness.

**Sand Island**,  $1\frac{1}{4}$  miles west of Eastern Island, is  $1\frac{1}{2}$  miles long,  $\frac{3}{4}$  mile wide, and 57 feet high, on the summit of which a flagstaff has been erected. There is very little vegetation on this island, and the glare from the sand is very trying to the eyes.

The observation spot near the SW. end of the island is in latitude  $28^{\circ} 12' 22''$  N., longitude  $177^{\circ} 22' 23''$  W.

**Sand Spit**.—Near the NW. point is a sand spit which varies in size considerably from time to time, sometimes almost disappearing.

**Welles Harbor** is formed by a gap in the coral reef, and is roomy and safe, with the entrance open to the westward, and 250 yards wide where most contracted.

The bar, which is well within the entrance, and on which there is no swell during the trade winds, is narrow, and has an uneven bottom of coral rock and small sand holes; its depth varies from 16 to 21 feet, but changes so often and suddenly as to make it unsafe to

count on crossing without getting a cast of 18 feet. Inside the bar the depth for anchoring is from 5 to 7 fathoms, white sand. The harbor is therefore only fit for vessels drawing less than 18 feet; vessels of deeper draft must lie in Seward Road, picking out a sandy bottom to anchor on.

The lagoon near the center of the reef is 2 miles long and  $1\frac{1}{2}$  miles wide, with many coral heads in it, with from one to 2 fathoms water over them.

Welles Harbor is separated from the lagoon by shoal water, one mile in breadth, and as far as could be ascertained there is no passage for vessels. It might be possible for a light-draft vessel to get into the lagoon by passing to the northward of the middle ground, and threading the way in among the rocks, but no regular ship channel exists.

**Anchorage.**—On the west side, sheltered anchorage during the trade winds may be obtained in from 10 to 13 fathoms, but on a very foul bottom. The best outside anchorage is in Seward Road in from 10 to 13 fathoms at the entrance to Welles Harbor, but it is not recommended.

The coral ridge which extends from the NW. end of the reef to the southern wall gives very irregular soundings, having deep fissures between the rocks, and again spaces of sandy bottom; the *Lackawanna* lost both anchors here.

**Directions.**—Steamers, when approaching Midway Islands from the eastward, should make Eastern Island, and pass round the southern side to the anchorage in Seward Road. If coming from the westward, Sand Island should be made.

Sailing vessels from the eastward, during the trade season, should keep to the northward of the reef, and pass round the NW. rocks, so as to retain a fair wind to the anchorage.

Square-rigged vessels must warp into the harbor during easterly winds.

**Supplies.**—Fish of many varieties are plentiful, turtle abound. A few curlew and plover are the only land birds on the islands.

Water may be procured on both islands by digging from 4 to 7 feet, and though at first full of impurities, yet, by filtration and allowing it to stand, it becomes drinkable.

**Wind and weather.**—In July, 1867, the trade wind blew strong, with clear weather; during August of the same year the weather was generally fine and clear, with light winds from NNE. to SSE.; rain fell on 6 days, usually at night and but seldom accompanied by wind; the thermometer ranged from  $72^{\circ}$  to  $89^{\circ}$ , and the barometer from 29.92 to 30.25.

**Tides.**—It is high water, full and change, at 3h. 28m. Springs rise  $1\frac{1}{2}$  feet, neaps one foot. The tides are regular, and at the

outer anchorage the flood sets to the northward and the ebb to the southward from one to 2 knots. In Welles Harbor the current always runs out to the westward, but not with much strength.

**Ocean (Cure) Island**, lying 56 miles W. by N. of Midway Islands, which it closely resembles, both in formation and appearance, consists of an island  $1\frac{1}{2}$  miles long and  $\frac{3}{4}$  mile wide, and two small islets or sand banks, surrounded by a reef, somewhat oval in shape, which incloses a lagoon, the entrance of which is to the southwestward, about one mile in width and shallow.

The atoll is  $14\frac{1}{2}$  miles in circumference and no outlying dangers have been observed.

Green Island, in the SE. corner of the lagoon, is about 20 feet high, covered with small shrubs, and similar to the eastern of the Midway Islands. To the westward of it are two small islets or sand banks, the western of which is about 10 feet high.

A bank extends round the reef to about one mile, with 20 to 30 fathoms water over it. The best anchorage is on the west side, near the NW. point of breakers, in from 8 to 12 fathoms, rocky bottom. From the appearance of the islands they are sometimes visited by severe storms, the sand being thrown in numerous cones and pyramids.

#### DOUBTFUL ISLANDS AND REEFS.

**Byer Island**, also called Patrocinio, was discovered, in 1799, by Captain Zipiani, and was seen by Morrell in 1825. It is in latitude  $28^{\circ} 32' N.$ , longitude  $176^{\circ} 55' E.$ ; it is shown as P.D. on the charts.

This island, about 4 miles in circumference, is described as of volcanic origin, of moderate height, and has some shrubs and smaller vegetation on it.

The only danger is on the SE. side, where a coral reef stretches 2 miles to the southward. There is good anchorage on the WSW. side in 15 fathoms, sand and coral.

This island is the resort of sea fowl, sea elephants, and turtle, and fish abound in the vicinity. Fresh water may be obtained on the SW. side of the island.

**Morrell Island** is so called from the name of its discoverer. It is placed in latitude  $29^{\circ} 59' N.$ , longitude  $174^{\circ} 31' E.$ , is said to be a small, low island, nearly level with the water, and about 4 miles in circumference, with reefs extending from it for about 15 miles to the west, and about 30 miles in a SSE. direction. The existence of this island is doubtful and it is so marked on the chart.

**Note.**—Neither of the two islands above mentioned have been seen for many years, and it is quite possible that the discoverers' positions were so much in error that what they really sighted were western islands of the Hawaiian Group.

**Mellish Bank**, which is placed on the chart in latitude  $34^{\circ} 25'$  N., longitude  $178^{\circ} 47'$  E., has been reported to have a depth of 64 fathoms over it, but this position is doubtful, as reports of soundings having been obtained in this vicinity vary greatly.

**Ganges Island, or Reef**, placed on the chart in latitude  $31^{\circ} 28'$  N., longitude  $154^{\circ} 00'$  E., is about the mean position of the many dangers that have been reported at various times in this locality, but nothing positive is known as to their proper position, though the numerous reports point to the fact of the probable existence of some danger in this region, the establishment of which is important.

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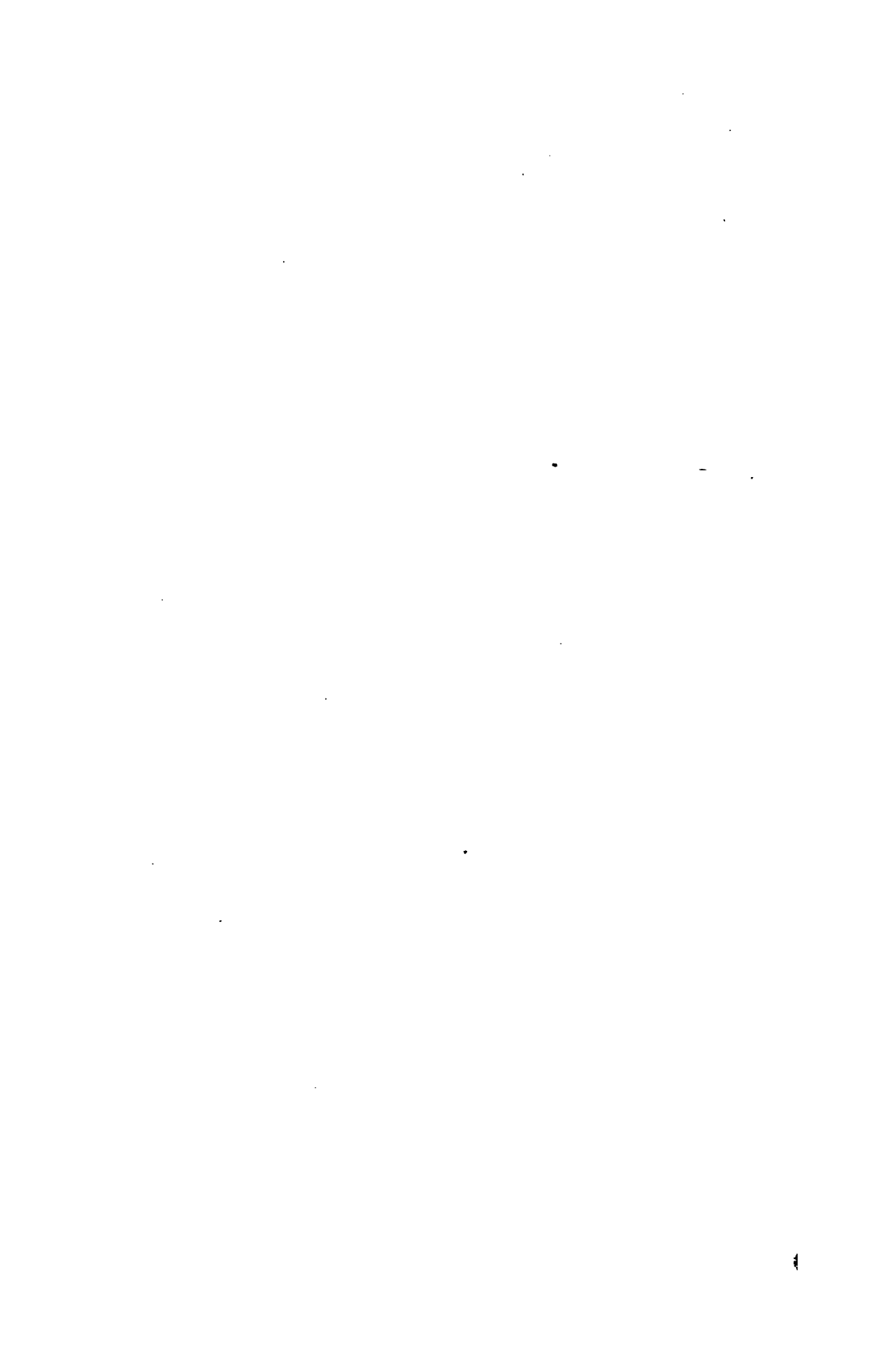
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